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Reducing the stress of hospitalization for open heart surgery.

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REDUCING THE STRESS OF HOSPITALIZATION FOR OPEN HEART SURGERY

A Dissertation Presented

By

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Dedicated

to

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ABSTRACT

Reducing the Stress of Hospitalization

For Open Heart Surgery

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The stress of hospitalization for cardiac surgery can be described as nothing less than dramatic and possibly overwhelming. Cardiac patients, suffering from failing health, often react with feelings of fear and helplessness when faced with surgery. They may grieve their lost health and try to justify their decision while anxiously awaiting surgery. Surgery itself is a massive physical assault on the body. Following surgery, the patient must suffer through difficulties in breathing and other frightening aspects of intensive care such as numerous monitoring devices. The postoperative period is filled with discomfort and possible psychological problems from depression to postcardiac delirium. The stress of cardiac surgery is a problem.

There is a limited amount of research that attempts to explore and evaluate methods of stress reduction for cardiac

and other types of surgery. The only method widely accepted and regularly employed is preoperative teaching. Even though other techniques, such as hypnosis, have demonstrated value, they are rarely employed in helping to reduce stress. Previous research suggests several guidelines to be followed in developing effective methods of stress reduction that would have a higher probability of being employed. Guidelines include cost efficiency in terms of time and money, ease of use, relevance to crisis situations, and patient involvement in self-care. Tape recorded instructions for relaxation and the suggestion of positive expectancies presented with a music background were chosen as a treatment intervention that met these guidelines.

The treatment tape was compared with a control tape of music alone in a population of forty patients undergoing open heart surgery. The dependent variables consisted of subjective and objective indices of stress and recovery. Many variables indicated as extraneous sources of variance were controlled by a matching procedure across groups.

Analysis of the data produced two significant treatment effects. First, the treatment tapes were more effective than the control tapes in reducing postoperative reports of pain. This was interpreted to be due to the tapes' specific

relaxation effects, including muscular relaxation, its cognitive strategies for dealing with pain, and by its expression of personal caring. The treatment tapes were also found to be more effective in producing relaxation. There were no significant differences between groups in sleep satisfaction, anxiety levels, postoperative days of hospitalization, and in the use of analgesics. In general the tapes were extremely well received by the patients.

Relaxation and the suggestion of positive expectancies, delivered by means of a taped recording, was concluded to be an easy to use, cost efficient, and effective method of stress reduction as measured by pain ratings, relaxation ratings, and patients' expressed psychological satisfaction. Although other recovery indices did not appear to be influenced by the treatment, the control condition, a music tape, may also have been an effective stress reduction treatment. Further research, using a no tape condition is being completed to answer this question. Long term follow-up research is also being planned. Replication of this study is suggested. Other recommendations included increased involvement of the surgeon in making and presenting the tapes, nursing staff education about the value of psychological interventions, and increased use of stress reduction tapes preoperatively.

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INTRODUCTION

The purpose of this study is to develop and clinically evaluate a method of stress reduction for open heart surgery that employs the techniques of relaxation and the suggestion of positive expectancies. In order that a succinct statement of the research problem might be presented, the chapter on the review of the literature precedes the chapter on the formulation of the problem.

CHAPTER I

REVIEW OF THE LITERATURE

Stress and Hospitalization

The concept of stress. Stress is now a fundamental concept in the fields of medicine and psychology and the object of much study. The work of Hans Selye has been perhaps the most influential. He advanced the idea of "stress" as a non-specific response of body functioning to any demand or stress (Mason, 1975; Mason, 1975A; Selye, 1975; Selye, 1965). He formulated the "general adaptation syndrome" as the body's reaction to stressors which included a defense of chemical and structural changes involving the pituitary-adrenocortical system. More specifically, when someone perceives a danger, his heart rate may increase, his breathing may become heavier, he may get cold or sweaty, he may get diarrhea, constipation, or even bladder spasms. His serum cortisone and adrenaline levels may increase. The internal physiological changes may defensively raise resistance or cause disease if the reaction is faulty or prolonged.

Selye's original conceptualization of stress in the physiological field has not been uniformly accepted or proven. For instance, his belief that there is absolute

non-specificity of some bodily reactions, or stated another way, that different stressors provoke an identical biological reaction in the organism, is disputed (Mason, 1975A). Mason suggests that relative non-specificity is more likely the case. He refers to studies that indicate that stressors such as heat, fasting, and moderate exercise may indeed not stimulate the pituitary-adrenal cortical system unless they are studied under conditions which also elicit emotional reactions (Mason, 1971; Mason, 1974). Mason believes that one major development in the stress research over the past twenty years has been the increasing awareness of the remarkable sensitivity of the pituitary-adrenal cortical system to psychological and social influences.

Psychologically, stress can refer to the subjective experience of the organism in reaction to stressors. Selye (1956) noted the word stress often is used in everyday language to refer to nervous tension, strain, or distress. Various self-report or self-ratings techniques have been used over the years to study subjectively felt stress.

Psychological studies of stress have also focused on the stress producing events. Holmes and Rahe (1967) developed a measure of psychosocial stress called the Social Readjustment Rating Scale (SRRS). It is a list of forty-three life events which require varying amounts of behavioral

adaptation such as pregnancy, marriage, divorce, etc. They propose that life events demand varying amounts of adaptive change of behavior that exacts a price from the organism in terms of wear and tear. Both positive and negative subjective experiences are conceived as psychosocial stressors. Individual stress scores are determined by having the individual record the life events experienced during a specific time period and adding up the "life change units" assigned to each event. The scores reflect the amount of adaptation demanded. The SRRS has been elaborated on by Hough, et al. (1976) to increase the specificity of listed events and thus, allow more consistent item integration.

Scores on the SRRS have been used to predict illness and physiological disorders. For instance, Rahe (1975) found that 50 per cent of individuals accruing 150-300 life change units will report illness during the succeeding year. Seventy per cent of those who accrue over 300 points will report illness during the succeeding year. This demonstrates that knowledge of stressor or stimulus conditions does not necessarily allow prediction of psychological or psycho-physiological responses. A stressor is only potentially capable of eliciting responses. Mason (1975A, 1974) notes that individual differences with regard to such factors as past history, threat appraisal, and coping or defensive styles must be considered. However, recent studies on

life events as precipitating factors have tended to ignore personality traits, behavior patterns, or what can be called predisposing factors. Certainly not everyone finds marriage equally stressful or requiring the same amount of adaptation. The capacity to deal with stressful life events can be conceptually related to consensual notions of a well-functioning person such as ego strength, psychosocial competence, etc.

In summary, the word stress can be used to refer to physiological reaction as well as subjective experience and even psychosocial events. In this paper, the word stress is used to denote the psycho-physiological response (including both the measurable physiological reactions and the psychological subjective experience) of an individual to any demand or stressor. The importance of considering stress, stressors, and predisposing factors in research is accepted.

The stress of hospitalization. Hospitalization is an experience considered to produce stress (Volicer, 1978). There are studies that identify and measure actual physical changes believed to be indicative of stress shortly before or at the time of hospitalization. These include increased urinary corticosteroid levels (Mason, et al., 1975), elevated urine potassium levels (Messanatte, 1970), and increased

systolic and diastolic blood pressure (Fleischman, 1976; Graham, 1971).

The psychological response to hospitalization has also been the subject of writing and research. Titchener (1960) describes the internal stress state of surgery patients as images, feelings, memories, and fantasies reflecting the patient's interpretation of the external stressors of diagnosis and preparation for an operation. The persistence of the stress state is observable in the recovery period, in convalescence, and perhaps long after in purely psychological symptoms such as depression, anxiety, phobias, or in a change of character, lifestyle, a fixed response to stressors, in unconscious resistance to surgical treatment, and continuing somatic symptoms.

The emotional condition of surgical patients has often been measured in terms of fear and anxiety using various procedures, usually self-report scales. The consensus is that patients do manifest anxiety and fears, yet the meaning of this stress experience is not clear. Janis (1958), for instance, found a curvilinear relationship between preoperative anticipatory fear and postoperative emotional adjustment. Both high and low fear subjects had greater difficulty than moderate fear patients. Janis has been criticized for his methods, i.e. the use of a case study

approach using very few subjects, the classification of subjects without definite psychological or physiological signs, and the absence of controls (Graham, 1971). Wolfer and Davis (1970) performed a provisional test of Janis' hypothesis as part of their research. Their data indicates that a linear, not a curvilinear, relationship might be operating. They suggest the need for future research to assess and control for situational variables and the patient's coping ability. Janis appears to have assumed that the level of anticipatory fear itself was a reflection of coping ability.

Hospital stress has also been considered from a psychosocial viewpoint. A tool similar in design to the SRRS was developed to quantify the general psychosocial stress due to hospitalization. It is called the Hospital Stress Rating Scale (HSRS) (Volicer, 1974; Volicer, 1973; Volicer, 1975; Volicer, 1977). The HSRS items have been clustered into nine stress factors including unfamiliarity of surroundings, loss of independence, separation from spouse, financial problems, isolation from other people, lack of information, threat of severe illness, separation from family, and problems with medication. Although the HSRS is a list of stressors, not a direct measure of stress response, scores on the HSRS have been related to physical and psychological measures of stress (Volicer and Volicer, in press).

Volicer (1978) found that patients who scored higher on the HSRS tended to report more pain, lower physical status during hospitalization, and less improvement after discharge than patients scoring low on the HSRS. Also, Volicer and Burns (in press) found that surgical patients reported higher stress than medical patients.

In summary, hospitalization is an experience that often results in a stress reaction, both physiologically and psychologically. The psychosocial stressors of the hospitalization experience and the individual differences in reaction to these stressors, or predisposing factors, have also been addressed.

The Stress of Open Heart Surgery

The drama of heart surgery. Patients undergoing open heart surgery are subject to high amounts of stressors and stress. In fact, it is surrounded by "an aura of drama and crisis" (Aiken, 1977). Previous to heart surgery, patients often have a history of problems secondary to heart problems (Titchener, 1960; Yuille, 1978). There may have been months or years of insidiously increasing physical disability and other changes in their health. Some may even become bedridden. Often there has been increasing dependency on others and relinquishment of responsibilities.

Patients may feel they are a burden to others. Presurgical procedures, such as an angiogram, are often traumatic, as are waiting for the results and possible surgery decision.

Once the decision for surgery has been made, a whole new process begins. One article, that of Rakoczy (1977), is particularly impressive in describing the preoperative period. From a qualitative study of the thoughts and feelings of patients scheduled for cardiac surgery for the first time, she observed most patients to pass through four stages while waiting for surgery in the hospital. The first period was labeled "confrontation" in which the patient faces the reality of the impending surgery. In this period they made statements of reason for the surgery, usually a "last resort". They expressed concerns of helplessness and fears of disability and death. Patients seemed supported in this period by confidence in their doctors and the surgical technology, as well as references to other successful patients.

The next period was labeled "self-reflection", in which the patients made statements revealing an effort to justify or explain the cause of the heart problem. Some indulged in self-pity or grieving of the loss of control of their health. Others specified concrete factors such as weight or occupation as causative of their problem. In the next

period, "the resolution stage", patients attempted to integrate the meaning of the surgery into their self-concepts. They expressed hopes for recovery and the rebuilding of confidence in relation to the decision for surgery. The last phase, "the countdown phase", usually occurred the day prior to surgery. It was a period of waiting while time passed, sometimes unbearably slowly. Many said they were "all talked out". More than half of the patients passed through all the stages, although the stages were not necessarily discrete and did overlap. Progression through all stages was associated with fewer days hospitalization postoperatively.

The stress of the actual surgery. Patients often report that they are least prepared for the period immediately following surgery (Kennedy, 1966; Miller and Shada, 1978). The experience of the recovery room and the intensive care unit with the special monitoring devices and numerous I.V.'s is very frightening. The ICU has been thought to contribute to psychological problems due to the sleep deprivation, sensory isolation, and decreased ability to communicate (Dlin, et al., 1968). McFadden and Giblin (1971) noted that sleep deprivation is a definite problem that occurred for the first six nights postoperatively. Although their study was limited to a few patients, none were able to make up for that deficit during the day. Difficulties in breathing and

respiration, especially the use of the endotracheal tube and respirators, sometimes lead to a feeling of choking to death and panic. Most feel unprepared for the respiratory problems and the amount of mucus that may be present. Although this is explained in preoperative teaching by many institutions, perhaps not all patients can assimilate this information preoperatively.

In this first one to seven days postoperatively, patients present a mixture of symptoms including pain and discomfort, mood changes from euphoria to depression, fatigue, and even psychiatric problems. Postoperative psychiatric problems occur more often with open heart patients than with general surgery patients (Kimball, 1969; Lasater and Grisanti, 1975). Heller, et al. (1970) grouped patients into three categories: 1) clear, although anxiety and depression may occur; 2) organic brain syndrome with neurological symptoms upon awakening from anesthesia; and 3) postcardiotomy delerium (PCD). By far, PCD has been the subject of most attention with estimates of occurrence ranging as high as seventy per cent (Baxter, 1975). The description and measures vary but in general PCD is a syndrome similar to classical organic confusional states with disorientation for time and place, poor recent memory and intellectual functioning, illusions, hallucinations, and

even paranoid ideation. These reactions classically occur two to seven days postoperatively and frequently follow a lucid period. In general, it is believed that these reactions are multidetermined (Layne and Yudofsky, 1971). The factors involved will be addressed in the next section of the paper, predisposing factors.

In summary. Hospitalization for open heart surgery is a stressor. The hospital and surgical procedures involved lead to dramatic stress reactions both physiologically and psychologically, such as preoperative fears and grieving, postoperative breathing difficulties in the ICU, and possible psychiatric complications. In the next section, the role of predisposing factors will be discussed in relation to stress reactions and general recovery from surgery.

Predisposing Factors to Stress Reactions In Open Heart Surgery Patients

Postsurgical recovery. A good postsurgical recovery for open heart surgery would ultimately be defined as a successful surgery with the patient fully restored to health. In most studies, it is operationally defined in more specific ways such as the number of days of hospitalization before discharge and/or the absence of pain and psychiatric problems. Thus, postoperative recovery refers to the occur-

rence and severity of stress reactions or indicators of stress such as morbidity or mortality.

Rakoczy (1977) defined good outcome as a shorter post-operative hospitalization, eight to fifteen days. She noted that age, sex, duration of symptoms, educational and economic status were unrelated to outcome for open heart surgery patients. Heinrichs (1969) found age, sex, and preoperative cardiac disability were unrelated to mortality postoperatively. Brown, et al. (1978) noted males to have an earlier hospital discharge and to engage in earlier self-care. Sex was unrelated to transfer from the ICU and the use of pain medications and tranquilizers. However, increasing age was related to increased use of medications and tranquilizers.

Predicting general outcome from psychological variables has also been only sparsely studied. Rakoczy (1977) noted that good preoperative coping, defined as progression through all of her preoperative psychological stages, and the presence of good family and doctor-patient relationships were related to a good outcome, or shorter hospital stay. Kimball (1969) noted that successful preoperative coping, moderate anxiety, absence of depression, and a strong future orientation were related to fewer complications, decreased mortality and morbidity, and an increased level of functioning after discharge. Heinrichs (1969) noted that anxiety

and depression are expected; it is the efficiency of coping that is important. She observed that males who were agitated and anxious and females who were emotionally overcontrolled (i.e. denying psychological aspects of illness and expressing increased physical complaints) were more vulnerable to stress and suffered higher mortality rates postoperatively.

These few studies, with differing variables studied in relation to different outcome criteria, offer little in the way of conclusion as to what predicts a good recovery. However, one postsurgical reaction, PCD, has been the subject of more frequent study. Studies to date indicate that PCD is probably due to an interaction of factors, some physiological and some psychological, but much research is still needed to delineate these factors and how they interact (Elsberry, 1972). Elsberry (1972), in a review of the literature, noted that physiological variables such as microembolic phenomena, cerebral ischemia, hypothermia, and hormonal substances have been strongly implicated as being related to the incidence of PCD. However, findings concerning psychological variables are less consistent. In general, the most consistent variables related to PCD are the severity of physical illness, degree of surgical stress, increased age, and the presence of brain damage. Morse and

Litin (1969) feel that age may be a factor in relation to increased chances of atherosclerosis and cerebral ischemia. Sex differences, although reported by some researchers as related to PCD incidence, have more often not been related to PCD. The sensory deprivation of intensive care has been implicated but is still in need of better evaluation. Preoperative personality was also generally (although very inconsistently) found to be not predictive. Elsberry (1972) noted in his review that comparison of different studies is difficult at best as the definitions of psychological stress or PCD varied between studies. Also as operative procedures have been developed and changed over many years, their impact on these studies has not been controlled.

In summary, postoperative recovery has been operationally defined as the occurrence and severity of different stress reactions or indicators of stress reactions such as pain, PCD, morbidity, and mortality. Studies attempting to isolate predisposing factors that would predict a successful recovery do not offer a clear picture. Differing predisposing variables studied in relation to differing outcome variables make conclusions difficult from relatively few studies. An exception to this is the study of PCD. Here a greater number of studies has allowed some consistency of findings. Yet, even here, varying definitions of PCD and

other differences between studies make comparison difficult at best.

Reducing the Stress of Hospitalization and (Cardiac) Surgery

The recognition that hospitalization for surgery is stressful and related to recovery has stimulated research into methods of stress reduction. This review will include studies of stress reduction with general surgical populations as well as with cardiac patients as there are only a few studies of stress reduction for cardiac patients. Also, the other studies offer results generalizable to cardiac patients.

Preoperative teaching. Preoperative teaching (the subject of the majority of all the studies) has been generally successful in reducing stress for surgery patients (Dumas, 1963; Egbert, et al., 1964; Healy, 1968; Lindeman, 1972; Mezzanatte, 1970; and Marshall, 1978). The usual focus of preoperative instruction is to supply the patient with detailed information about the hospital and surgical procedures along with psychological reassurance. There are few objective evaluations of the effectiveness of preoperative teaching with cardiac patients. Miller and Shada (1978) demonstrated that cardiac patients do desire information.

Kinney (1977) found that cardiac patients, regardless of coping style, responded to preoperative teaching with decreased anxiety postoperatively. Still, strong relationships between condition and recovery for cardiac patients is missing. Although the results of all studies generally support the use of preoperative teaching even with cardiac patients, it is not beyond question as being the only or best technique for these patients.

Often deep breathing and bed exercises are also included with, or as part of, preoperative teaching. These instructions are often directly related to postoperative recovery. For example, deep breathing is considered important as it helps prevent postoperative complications. Restricted breathing is associated with pain, fear, and anxiety (Lindeman, 1972). Physical exercise and activity is associated with early ambulation and faster healing of wounds as well as decreased pain and faster normalization of pulse and respiration (Healy, 1968). With respect to cardiac patients specifically, breathing exercises have been demonstrated to reduce incidence of pulmonary complications and the necessity for percutaneous catheters in high risk patients (Vraciu and Vraciu, 1977).

Hypnosis. The use of hypnosis has also been studied as a method of stress reduction. Kolouch (1962 and 1964),

a general surgeon, found hypnosis to be of benefit both subjectively and objectively to over 250 patients. They were remarkably confident in their ability to get well and often had reduced needs for postoperative pain medications, as well as shorter hospital convalescent periods. He points out that the surgical patient is in a very suggestible frame of mind as was noted by Weiss and English (1957). Kolouch noted that suggestion at the waking level, during sleep, or in hypnosis, can create fear or confidence which seems to affect the adaptive capabilities of the surgical patient. Confident hope speeds recovery. Doberneck, et al. (1959), who also had positive results using hypnosis with general surgical patients, noted that the spirit of cooperation developed by the use of hypnosis allowed the surgery to be accomplished in an aura of cheerfulness rather than resignation.

Bonilla, et al. (1961) reported using hypnosis with many varying types of general surgery patients both pre- and postoperatively. They found their techniques to decrease postoperative pain, to decrease fears and anxieties, to stimulate appetite, to control nausea and vomiting, and to promote rest and sleep. They noted that an experienced and specifically trained hypnotist was unnecessary.

There are only two studies of the use of hypnosis with cardiac patients. Marmer (1959) used hypnosis with eight patients undergoing heart surgery. He found that the reassurance which can be induced by hypnosis reduced pain, fears, anxiety, and tension.

The second study of the use of hypnosis with heart patients is of special interest because it employed self-hypnosis. Gruen (1972) used Jacobson's (1929) progressive relaxation and auto-suggestion for three weeks prior to his own heart surgery. He was observed to recovery quickly with less than average use of pain medications. Also, he had a sense of well-being and optimism about the future. He felt three factors were involved in this success: 1) a state of relaxation or readiness to incorporate new ideas. Anxiety or tension is felt to interfere and be associated with fearful cognitions; 2) the cognitive input or belief that the procedure will work; and 3) the phrasing of suggestions as positive statements with immediate and long-range reinforcement value. For instance, "I will not feel pain," reinforces the notion that there is pain whereas, "I will feel comfortable," carries immediate reward in the pleasant image and long-range anticipation of good feelings. The advantage of using self-hypnosis is obvious in that it reduces the amount of professional time involved.

In keeping with the idea of self-hypnosis, Field (1974) designed an intervention that was even easier and less expensive to use. He had orthopedic surgery patients listen to a "hypnotic" relaxation tape one time on the day before surgery. The tape included suggestions not only for relaxation, but for freedom from pain during and after the operation, quick recovery, and confidence. The treatment group did not significantly vary from the control group on the surgeons' ratings of degree of nervousness on the day of the operation, or on the ratings of speed of recovery. However, a relationship was found between ratings of depth of relaxation and two surgical ratings, i.e. those patients who appeared to relax deeper during the tape did better. Also, the verbal reports of the treatment group were very positive about the tape, referring to improved relaxation and greater confidence in ability to cope with stress. It is not possible to reliably account for the individual differences in treatment response in this study, but, overall, the results suggest further investigation into the use of tape recorded relaxation procedures and the use of suggestion. More frequent use, both pre- and postoperatively, of this type of intervention is warranted.

In summary, the use of hypnosis has been studied and the results are generally favorable in reducing the stress of surgery, (including heart surgery) and improving post-

operative recovery. The major problem with this type of intervention probably accounts for its lack of use, i.e. few hospital personnel are adequately trained to use hypnosis. Also, it is time consuming and possibly not cost efficient. The idea of using self-hypnosis, i.e. a combination of relaxation and suggestion, on prerecorded tapes offers a solution to these problems. This idea is in need of further experimental investigation to substantiate its value.

Relaxation. Relaxation itself also has been the subject of investigation. In fact, there are three studies of the use of systematic or progressive relaxation with open heart surgery patients. Aiken and Heinrichs (1971) taught systematic relaxation, the muscle tension-release style progressive relaxation of Wolpe and Lazarus (1968), to a group of fifteen open heart surgery patients. The patients were instructed that this procedure would help them with such things as pain control, etc. They listened to a tape four times per day for an average of three and one-half days prior to surgery. Also, a nurse specialist spent fifteen minutes to one hour per day talking with the patients about their fears and concern. This constitutes a psychotherapeutic type of intervention. Neither the suggestion of positive expectancies nor the nurse visits (as described in the research articles) were controlled for, thus the results are difficult to attribute to the relaxation alone. The results

revealed the treatment group to have less postoperative psychiatric complications and a significant reduction in several factors judged to indicate surgical stress, including the degree of hypothermia, the amount of time on cardiopulmonary bypass, anesthesia time, and total units of blood received. Mortality was, however, not reduced.

Pearson (1976) also had patients listen to progressive relaxation (Jacobson, 1929) tapes three times per day, every other day, the week before surgery. His only significant finding on many dependent variables was a reduction in the use of Valium postoperatively. The exact nature of his procedures is not reported in the article referred to, and hence, the nature of the patient visits (psychotherapy) and the suggestions made about the intervention are unknown.

Bafford (1977) also studied the use of progressive relaxation (Jacobson, 1929) to reduce postsurgical stress in open heart surgery patients. Patients practiced with staff twice daily, both pre- and postoperatively, and also were asked to listen to a taped exercise twice daily. In this study, visits to the patient were controlled as a source of variance. Expectations that may have been suggested were not addressed in this research. The treatment group did tend (not to a statistically significant degree, however), to report less pain, use less medications, and

report less mental disturbance postoperatively. Another feature of this study was to classify subjects as "repressors" or "sensitizers" (Byrne, 1961), according to coping style. Repressors tend to avoid anxiety-provoking stimuli, whereas sensitizers tend to approach such stimuli in an effort to control it. Again, no significant differences were found between the groups. However, trends were noted towards less mental disturbance and lower interpersonal hostility ratings by nurses in repressors.

In summary, relaxation, as a stress reduction intervention for open heart or other surgery, is generally indicated to be a successful or potentially successful technique. Differences in procedures (such as the number and type of patient visits by staff and the expectations suggested) and population (Pearson used Veterans Administration Hospital subjects while Aiken and Heinrichs used university hospital subjects) make these studies unable to be compared. This author notes that other types of relaxation procedures other than progressive relaxation might be explored or compared. Also, the suggestion of positive expectancies must be controlled and evaluated. Comments from these authors are also promising enough to warrant further study. For instance, patients were able to participate despite dyspnea and general fatigue. Nursing staff also seemed to welcome this type of intervention.

Other interventions. The last type of intervention to be discussed is instruction in a specific cognitive-behavioral coping strategy. Langer, Janis, and Wolfer (1975) instructed a group of general surgery patients (for which prognosis was generally favorable) in reappraisal of anxiety-provoking events, calming self-talk, and cognitive control through selective attention. Specifically, they were instructed to turn their attention away from the negative aspects of experience and focus on the positive aspects when they started to feel upset. This intervention was compared with preparatory information, the coping strategy plus preparatory information, and a no treatment group. The coping strategy was found to reduce both presurgical stress ratings (by nurses) and postsurgical use of analgesics and sedatives. The preparatory information only had an effect in interaction with the coping strategy on the postoperative use of medications. There were no data reported on the patient's subjective evaluation of their postoperative experience. The major difficulty with this procedure is the need for costly professional time and expertise. It is noteworthy that the coping strategies described in this study are similar, if not identical, to the types of suggestions frequently given when hypnosis is used with surgery patients.

In summary. Preoperative instruction, hypnosis, relaxation exercises, and cognitive-behavioral strategies have all been explored and found to have at least some degree of effectiveness in reducing the stress of surgery and contributing to a better recovery. By far, preoperative instruction has been the most researched, and it is the only technique widely and consistently used. This warrants further research into these and other techniques of stress reduction for cardiac and general surgery. By far, the most promising areas suggested by the review of the literature appear to be the use of tape recorded relaxation and suggestion of positive expectancies. The suggestion of positive expectancies is defined here to include the basic elements of cognitive-behavioral coping strategies.

CHAPTER II

FORMULATION OF THE PROBLEM

The Problem of Stress and Cardiac Surgery

The problem. The preceding review of the literature documented in detail that stress is a fundamental concept in medicine and psychology. It is a concept that has been well applied toward an understanding that hospitalization for cardiac surgery is a stressor that results in physiological and psychological stress reactions. Cardiac patients, often suffering from failing health, react with feelings of fear and helplessness when faced with surgery. They may grieve their lost health and try to justify their decision while anxiously awaiting surgery. Surgery itself is a massive physical assault on the body that will take some time to heal. Following surgery, the patient must suffer through the difficulties in breathing and other frightening aspects of intensive care with its numerous monitoring devices and I.V.'s. The postoperative period is filled with discomfort and possible psychological problems from depression to postcardiotomy delerium. Thus, the stress of hospitalization for cardiac surgery can be described as nothing less than dramatic and possibly overwhelming. The stress of cardiac surgery is a problem.

Guidelines. The previous research suggests several important guidelines to be followed in future research. Important guidelines include a method that is cost efficient in terms of expense and time. The less professional time that is involved, especially that of non-medical personnel, the more likely a new method is to be utilized. For example, it is unlikely that a method that required the expensive use of psychiatric or psychological personnel would be utilized. One reason preoperative instruction has been successful is that it can be presented on audio and/or visual recordings, by written materials, and by nursing personnel.

A second guideline is that the method be easily used and accepted by the patients. Thus, the intervention must be relevant to the crisis event and easy to learn. A third guideline is to develop methods that incorporate the psychologically sound philosophy of nursing which states that a patient must face hospitalization as a responsible person whose rapid recovery depends largely on his own active participation (Healy, 1968). Methods which include the patient as an active participant reinforce and strengthen feelings of self-independence and internal control. That is, even though the patient may not have control of many hospital events, he still has control over his reactions to these

events and his environment. In summary, future research should develop and evaluate methods of stress reduction that are easy to use by both patients and existing nursing staff, relevant to the crisis situation, and designed to actively involve the patient in his own recovery. Given these guidelines, what methods of stress reduction should be researched and developed?

Areas of future research. There are two elements or methods of stress reduction that are strongly suggested as worthy of study by the prior research on stress reduction for surgery. These are the use of relaxation and the suggestion of positive expectancies. Relaxation is indicated by the studies of systematic or progressive relaxation by Aiken and Heinrichs (1971), Pearson (1976), and Bafford (1971). All three studies demonstrated enough success to warrant further evaluation. Relaxation is also a prominent feature of hypnosis, which has been shown to be an effective method of stress reduction (Marshall, 1978).

The second area suggested for future study is the suggestion of positive expectancies. The success of studies that use hypnotic suggestion implicates that this variable may be of crucial importance. Yet, this variable is also uncontrolled for (or taken for granted) in their studies. For instance, in Aiken and Heinrichs' (1971) study of the

use of systematic desensitization for open heart surgery, each patient and his family, if possible, were given an explanation of the importance of relaxation and how it would lead to reduced stress and reduced pain in the postoperative period. The suggestion of positive expectancies may be a factor in preoperative instruction as well. Preoperative teaching does not supply factual information free of suggestion. It is implied or suggested that listening to the information and following the breathing exercises will help patients feel better and recover. Finally, it is noted that the suggestions of positive expectancies may offer coping strategies to patients.

The value of relaxation and positive expectancies in reducing stress, both psychological and physiological, is probably best exemplified today in the field of self-regulation, which includes the study of biofeedback, relaxation exercises, meditation, autogenics, self-hypnosis, and cognitive-behavioral strategies. The field of self-regulation has focused on stress and its relation to disease. Self-regulatory techniques have been used to manage, reduce, and even eliminate the symptoms of such diseases as hypertension, arteriosclerosis, migraine, cancer, arthritis, and respiratory disease (Pelletier, 1977). The question of study in this field is not whether self-regulation is possible, rather, how it is possible. The research most

strongly supports the following variables as most important in learning and/or achieving self-regulation: a) a state of low arousal which is usually accomplished by methods that involve sensory restrictions, e.g. relaxation procedures; b) the manipulation of beliefs to make self-regulation credible, e.g. the referral to scientific research, instruments, graphs, etc., by a credible source such as a doctor; and c) the positive expectation that self-regulation will occur (Wichram, 1979). The last two clearly overlap and may even be combined.

In summary, relaxation and the suggestion of positive expectancies are seen as two factors to be developed and researched in reducing the stress of open heart surgery. This is supported not only by prior research in surgical stress reduction, but also by the findings in the field of self-regulation whose primary focus has been stress reduction in general. The guidelines of ease of use, relevance, and patient participation should be kept in mind when developing a method based on these techniques to encourage later use of techniques found effective.

Purpose of the Study

The purpose of this study was to develop and clinically evaluate a method of stress reduction for open heart sur-

gery that employed the techniques of relaxation and the suggestion of positive expectancies. The key elements of this statement are here defined to help clarify the focus of this study. Open heart surgery patients refers to persons undergoing either a cardiac bypass, valve repair-replacement, aneurectomy, or some combination of these surgeries at the University of Arizona Health Sciences Center Hospital. Stress refers to the psychological and physical reactions of these patients to the experience of hospitalization and surgery as measured by self-ratings of subjective experience and objective postoperative recovery indicators. Relaxation refers to a subjective state of lowered arousal, i.e. lowered physical and mental tension. Expectancies refers to the thoughts and/or beliefs by the patient, in this case, about his surgery and its outcome.

Specifically, the goals of this study are: 1) to develop an easy to use method of stress reduction for open heart surgery patients employing the techniques of relaxation and the suggestion of positive expectancies; 2) to evaluate the effectiveness of this method in reducing stress in a research project of experimental design.

The results of this study will hopefully offer an additional method of stress reduction for open heart surgery patients that will be easily employed. Reduced stress means a

better recovery and a healthier patient. The results should also contribute to the current body of knowledge about the techniques of relaxation and positive expectancies for stress reduction in a clinical setting. Finally, this research should stimulate further study into the problem, and solutions, of the reduction of the stress of surgery.

CHAPTER III

METHODS OF PROCEDURE

Introduction. This chapter describes the methodology of an experimental study of a treatment aimed at reducing the stress of hospitalization for open heart surgery. Separate sections present the treatment intervention, setting and subject selection, procedures and data collection, choice of measurement of the dependent variables, problem statement, hypotheses, data analysis, the control of extraneous variables, and assumptions and limitations of the design.

The treatment intervention. The first goal of this study was to develop an easy to use method of stress reduction that was relevant to the crisis situation and designed to actually involve the patient in his own recovery. Audio taped cassettes of relaxation instructions and suggestions of positive expectancies met these criteria.

As noted in the review of the literature, previous studies had employed either progressive relaxation or hypnotic suggestions. This author, in teaching self-relaxation and self-regulation procedures to over a hundred patients, has found repeatedly that progressive relaxation (muscle tension-release style) was not consistently rated as the most effective or easy to learn in comparison with other

procedures. It was also seen as advisable to avoid any relaxation exercise that sounded "too hypnotic" e.g. counting backwards, or the use of such words as "deeper and deeper" or "trance", etc. However, there were several different types of relaxation exercises from which to choose (Benson, 1975; Brown, 1977). Also, the study of hypnosis was now sophisticated enough to offer guidelines for making simple relaxation procedures even more effective (Bandler and Grinder, 1975). For instance, a simple fifteen to twenty minute method of inducing rapid analgesia for dentistry had been developed and shown to be effective with 99 out of 100 patients (Barber, 1977). The method incorporated suggestions for deep relaxation in normal conversation.

The relaxation exercise used and tested in an informal pilot study consisted of conversational style instructions given in a permissive manner. It was an exercise developed, tested, and used by this author over the last two years to introduce people to the art of relaxation. It had been employed successfully with psychiatric, medical, and normal populations. It started out by eliciting the subject's cooperation and setting some expectations of relaxation. It consisted of instruction in awareness and breathing, the release of body tensions, and the use of visualization of an ideal relaxation state. Of course, there were suggestions

of relaxation, comfort, and lowered arousal throughout the exercise. The relaxation process was described as a natural process. Integrated into this relaxation exercise were suggestions of positive expectancies about their surgery and recovery. It suggested that the hospital was a safe and interesting place with skilled and experienced staff to care for them. It stated that the operation had a positive purpose and that they could expect to benefit from it. Although they could expect some symptoms or discomfort after the operation, in general they could expect that they would be comfortable and recover quickly. Positive suggestions for sleep, self-assistance, movement, strength, energy, comfort, mental clarity, and interest in their surroundings were included. They were asked to think positively about their goals for the future after surgery.

This tape was received well in the pilot study, however strong suggestions were made by the pilot subjects for revisions. The suggestions included pleasant music in the background, a female voice, and the use of more than one tape. The suggestions for music had more than face validity as music of specific form and rhythm had been demonstrated to induce a relaxed state in the body (Ostrander and Schroeder, 1979). The music chosen for this study was ordered from the Superlearning Corporation, Suite 40, 17 Park Avenue, New York, New York, 10016. It consisted of four selections of

classical music, each with a slow, restful tempo averaging two to four minutes in length. Since all subjects were male, the use of a female voice was suggested to be more culturally acceptable for the purposes of soothing and comforting. Also, some males appeared to be threatened by an "intimate" male voice giving suggestions for relaxation. Dr. Gloria Bernat, a psychologist specializing in hypnosis and relaxation training, was the person selected to record the tapes. Finally, using more than one tape offered a chance to increase the placebo effect, as well as adding specificity and variety to the program. An introductory tape contained a brief statement from the participating surgeon to offer a rationale, to give importance and validity to the program, and to increase patient motivation (see Appendix A). This tape continued with instruction in relaxation and suggestions of positive expectancies about the surgery and recovery. A second tape was designed for the intensive care unit, with instruction in relaxation and suggestions related specifically to the intensive care experience, i.e. breathing and coughing, dealing with pain, etc. Finally, a third tape was designed for the postoperative ward experience. All the relaxation exercises were very similar to the exercise described for the pilot study to increase the practice effect. Transcripts of all the taped instructions appear in Appendix A.

The control group listened to a tape with just the music. The surgeon also introduced this tape in the same manner as the treatment tape. This procedure controlled for the placebo effect in determining the effectiveness of the relaxation exercise and suggestions of positive expectancies.

Settings and subjects. The settings for the study were the University of Arizona Health Sciences Center, a medical school teaching hospital serving the City of Tucson and surrounding areas, and the Tucson Veterans Administration (V.A.) Hospital. The study was approved by the research review boards of both hospitals. Patients from the V.A. Hospital were admitted to the University Hospital one to two days prior to surgery. All surgery was performed at the University Hospital. Veterans Administration Hospital patients were usually transferred back to the V.A. Hospital two to three days after surgery. Forty or more patients scheduled for open heart surgery, either coronary arterial bypass, valve replacement, aneurectomy, or a combination of these were selected for the study.

Patients scheduled for this surgery at the University Hospital were typically males, forty to seventy years of age. Almost all had had prior hospitalizations and many had other health problems, e.g. chronic pulmonary health prob-

lems. Only male patients were accepted as subjects. Patients were not accepted into the study if they possessed one of the following characteristics that might have possibly interfered with the interventions or influenced the results: a) patient was not fluent in the English language; or b) patient was a mental health worker, e.g. psychologist, psychiatrist, etc. Also, accepted patients were eliminated if their surgery or their recovery was atypical (e.g. unusual complications, additional operations, etc.), or if they received psychiatric consultation during the period of hospitalization that concerned this study.

Procedures of data collection. Patients were identified by the cooperating surgeons and their staff. Hospital charts were used to determine if the patients met the selection criteria. Patients were assigned to the control group in one time period and then to the treatment group in a separate time period to avoid having subjects in different groups sharing a room. The pilot data revealed subjects to average six days postoperative recovery (not counting the day of surgery and the day of discharge) for University Hospital patients and ten days postoperative recovery for V.A. Hospital patients. To assure uniform conditions of data comparison, and for simplicity and efficiency of data analysis, the first five days of the postoperative time period were used to collect data on all of the subjects.

Subjects were contacted individually in their hospital rooms the day before surgery by this author. They were told that a special study of the experience of open heart surgery was being conducted, and if they wished to participate, their written consent was obtained after explaining what was expected of them (see Appendix B). Participating subjects were interviewed briefly (about fifteen minutes) to obtain some initial data. Experimental patients were verbally presented with a prepared statement about the program similar to the surgeon's statement on the first tape. They were told of the series of tapes and instructed to listen to the appropriate tape twice daily starting the day prior to surgery and continuing the day after surgery for five days. They were asked to listen once during the day between 9:00 A.M. and 4:00 P.M. and again in the evening at bedtime, even as they went to sleep, if they wished. Each experimental subject was given a battery operated tape recorder with earphones. Nursing staff was notified of a patient's participation and patients were told they could ask for the nursing staff's assistance if needed. Nursing staff was given a brief explanation of the project during staff meetings and a notice was issued to reach nurses who may have missed the staff meetings (see Appendix C). Relaxation ratings were entered on a chart attached to the tape players. In the intensive care unit, participating patients were identified

by a notice posted along with other medical orders for each patient. Relaxation ratings were entered on this notice by nursing staff while the patient was in the intensive care unit. The relaxation charts are displayed in Appendix D. Patients could refuse to participate and/or terminate the project at any time. The procedure for the control group was identical except the tape with just music was used.

Each evening between 5:00 and 7:00 P.M. this researcher or a research assistant recorded some brief self-ratings, starting the day after surgery. Objective indices of recovery were obtained from the charts. Each patient's completed chart was reviewed to validate the surgical procedure and any postoperative complications. Qualitative data were collected informally throughout the study and formally on the fifth postoperative day in a brief patient interview.

Choice of measurement of the dependent variables. It was seen as desirable to use multiple outcome measures. Using more than one operational definition of stress in this study helped to strengthen the relationship between concept (stress) and measure (the dependent variables). The measurement of the stress of hospitalization for open heart surgery consisted of self-ratings of subjectively experienced stress and objective measures of postoperative recovery. However, due to the limited sample size, too many

measures would have made it difficult to achieve statistical significance on any one measure. Also, it was probable with multiple measures that they may have been highly correlated with each other and hence, may have been essentially measuring the same thing. This problem was handled by both the data analysis procedures (to be presented later) and by careful selection of measures. A pilot study was used to evaluate several possible measures which showed promise in demonstrating the treatment effect.

The first measure of subjectively experienced stress evaluated in the pilot study was a measure of state anxiety, half of the State-Trait Anxiety Inventory (STAI Form X-1) (Speilberger, 1970), (see Appendix E). State anxiety had been conceptualized for this test as a transitory emotional state or condition of the human organism characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity. This twenty item questionnaire took less than five minutes to administer. Its reliability and validity had been previously documented (Speilberger, et al., 1973). Since anxiety states are transitory, alpha coefficients offer a more meaningful index of internal consistency than test-retest correlations. In this respect, reliability coefficients ranged from .82 to .92 for the STAI Form X-1. There were several studies reported to document the validity

of the STAI Form X-1 in differentiating conditions characterized by different degrees of stress. Alpha reliability coefficients for one study of four different conditions of stress ranged from .83 to .94.

The STAI Form X-1 had also been used successfully to study pre- and postoperative anxiety levels (Auerbach, 1973). It had also been demonstrated to be sensitive to the effects of relaxation exercises (Johnson and Speilberger, 1968). The range of scores for this test was twenty to eighty points, the lower score representing less state anxiety. In the pilot study, the treatment group average score on postoperative days was fourteen points less than the average of the control group. Since this was one of the largest differences of the various measures, the measure was retained for the formal study.

A second measure of subjective stress in the pilot study was daily postoperative (starting on the day after surgery) ratings of perceived pain. A pain thermometer was used on which patients rated their experience of pain on a "0" to "100" scale as described by Johnson, et al. (1970) (see Appendix F). Pain ratings had been shown to be related to postoperative recovery, anxiety, and fear (Wolfer and Davis, 1970; Johnson, et al., 1970). This measure also demonstrated a large treatment effect in the pilot study. The

treatment group averaged 15.9 points less pain than the control group. Thus, it also was retained for use in the formal study.

The third set of measures evaluated in the pilot study was self-ratings on several areas of postoperative recovery. Postoperative recovery measures in the form of self-ratings of several areas of physical condition had been researched and suggested to reflect a combination of psychological and physiological effects (Volicer, 1978). Their ease of administration and scoring also made them desirable. Wolfer and Davis (1970) devised a Recovery Inventory that allowed patients to rate themselves on nine different categories such as sleep and appetite. The scores were shown to be sensitive to daily changes for general surgical patients. Based on this research, the review of the literature on open heart surgery, and conversations with the University of Arizona Hospital staff, a recovery inventory was devised for patients to rate themselves on sleep, appetite, strength and energy, comfort, mental clarity, self-care, movement, and interest in surroundings. Each category rated zero to five, produced a mean average score and all categories were added together to produce a total sum average score. Daily ratings started the day after surgery. Six of the eight categories showed better ratings for the treatment group, all but mental clarity and appetite. The individual ratings

that demonstrated the treatment effect the best were interest in surroundings, comfort, and self-assistance.

In the final study, only measures of interest in surroundings, self-care, sleep, and strength and energy were retained. Comfort was eliminated as it overlaped with the pain thermometer. Movement was found to be ambiguous for patients in meaning. The ratings were also changed to the 0-100 scaling of the pain thermometer as this was found to be easy for patients to use (see Appendix F). Also, having all measures use the same scale added consistency.

Another postoperative recovery index evaluated in the pilot study was self-ratings of mental disturbance. Elsberry (1972) recommended that an accurate and consistent quantitative measure of psychiatric disturbance be derived to allow inter-research comparisons. In this light, Bafford's (1977) system was found to be quite appropriate. From a content analysis of comments of heart patients after surgery, he constructed an ordinal scale of the severity of mental disturbance: 0, none; 1, dreams or mixed up from the medications; 2, memory loss or confusions; and 3, frank disorientation and/or hallucinations. The more serious complaint in multiple complaints was recorded, and the number of days that a "3" rating appeared was recorded and charted. This format was administered in a self-report form on a

daily basis postoperatively starting the day after surgery. The number 1 rating was changed to read "thinking impaired by medications". This measure was found to be ineffective in differentiating treatment from control conditions in the pilot study and was not retained in the final study.

Objective postoperative recovery measures or indicators were also used as a source of data. The following were shown to have a high enough base rate and sufficient variance to qualify as criteria of the patient's welfare for general surgery patients (Wolfer and Davis, 1970): the number of analgesics, the number of sedatives, the number of days in the hospital, the number of elevated temperatures (100 degrees farenheit [38 degrees centigrade] and above), the number of times out of bed, nausea, vomiting, and the day a catheter was removed. Measures with too low a base rate and variance were the number of anti-emetics, the number of times catheterized, and wound and/or respiratory complications. These variables were quantified by simply counting, where appropriate, or scoring the presence or absence of a condition as "1" or "0". This type of index was seen as appropriate for open heart surgery patients as well. The following indices were explored in the pilot study: the number of analgesics, the number of sedatives, the number of days of postoperative hospitalization, the number of elevated temperatures, the number of times out of bed, the number

of days catheterized after surgery. Due to problems in obtaining patient records, much of this data was not available for evaluation in the pilot study at the time of writing this proposal. However, it was noted that the number of times out of bed was not charted accurately enough to be of use and that the number of days catheterized after surgery was insignificant. The other measures were retained for the formal study and scored in the following ways. Analgesics were scored in equivalents of milligrams of morphine from conversion tables found in The Pharmacological Basis of Therapeutics (Goodman and Gilman, 1975). The number of sedatives was simply counted for each day due to difficulty in converting different types of muscle relaxants, tranquilizers, and sleeping pills to equivalent measures. Temperature was noted by recording if the patient had any incidence of temperature elevated above 38°C on a given day. This method was chosen because the number of times a temperature was taken and recorded on a given day varied from patient to patient, hospital to hospital, and ward to ward. Postoperative days were scored as less than nine or greater than ten days. This procedure was used to avoid distortions in group means due to patients who had extended hospital stays for whatever reasons.

A final group of outcome measures included the patient's subjective response to the interventions. The number of times a patient listened to the tapes was simply counted and recorded. Next his 0-100 ratings of relaxation (as described in the procedures section) were averaged. If a patient fell asleep, a score of eighty-five was recorded. Finally, the patient's overall subjective comments about the project were rated as positive, neutral, or negative. Data from these three variables were compared across groups. Obviously the subjective remarks supplied a wealth of qualitative data. These three variables also served as manipulation checks, that is, to confirm that the patient really received the treatment.

There were still too many dependent measures for effective statistical testing. To solve this problem, the formal research followed an experimental design that allowed both testing of hypotheses and generation of hypotheses. The STAI scores and the pain thermometer scores were used for hypotheses testing. All of the data, however, was subject to statistical procedures (to be described later) that allowed both assessment of measurement redundancy and the generation of hypotheses.

Problem statement. The problem statement guiding this research was: What was the effect of music, relaxation

instructions, and the suggestion of positive expectancies (treatment) as compared to music alone on the subjectively experienced anxiety and pain (dependent variables) in the recovery period for patients who had open heart surgery (as previously defined)?

Hypotheses. It was hypothesized that the treatment group, in comparison with the control group, would:

1. Report lower daily levels of anxiety as measured by the STAI Form X-1.

2. Report lower levels of daily pain as measured by the pain thermometer.

It was also hypothesized that the daily ratings of the treatment group, in comparison with the control group, would:

3. Improve at a faster rate as measured by the STAI Form X-1.

4. Improve at a faster rate as measured by the pain thermometer.

Thus, subjects in the treatment condition were predicted to demonstrate less stress than the control group in terms of their average scores on the STAI and pain thermometer; and subjects in the treatment group were also predicted to improve more quickly, that is, their daily ratings would improve at a faster rate than the control subjects.

The problem of control of extraneous variables. There were many extraneous sources of variance in this particular study. Control of these variables presented a special problem. Kerlinger (1973, 1979) listed four approaches to the control of extraneous sources of variance: elimination, randomization, matching, and the use of independent variables, therefore elimination and group matching were employed. Also various procedural checks were used.

The control of extraneous variables started by considering patient characteristics that might influence the dependent variable measurements. Age was indicated in previous studies to be related to postoperative recovery variables such as the use of pain medication and the influence of psychiatric delerium. Sex had been previously related to the length of hospital stay. In general, however, the review of the literature showed vastly inconsistent results and conclusions concerning the relation of sex and recovery. Thus, another reason to control for its influence. The hospital setting was thought to be a factor for a couple of reasons. First, the V.A. Hospital commonly serves a different population than the University Hospital. Second, the postoperative environment would differ. Evaluation of the results assumed uniform or controlled experimental conditions. The number of previous operations was thought to be

significant due to the previous experience of some patients and possible fears due to having a second heart operation. The type of operative procedure was also thought to be significant due to the influence of medical-surgical stress differences in the procedures.

It was concluded in the review of the literature that research on stress should take into consideration the amount of stressors (demands for adaptation) to which an individual has been recently exposed. It was decided that differing amounts of psychological stressor exposure might affect a person's ability to cope with heart surgery and to successfully benefit from the intervention aimed at reducing stress. In the pilot study, psychosocial stress was measured in terms of a score on the Social Readjustment Rating Scale (SRRS) of Holmes and Rahe (1967), (see Appendix G). The SRRS was described and discussed in the review of the literature. The SRRS was not without criticism, but was chosen as it had been the subject of more research than other measures. There were studies relating scores on the SRRS to various physiological disorders including myocardial infarction (Rahe and Paasikivi, 1971; Theorell and Rahe, 1971). The SRRS scores were found to be related to anxiety and pain scores in the pilot study.

Another individual characteristic considered was coping ability and style. It was decided that a psychologically well adjusted person might be able to deal more effectively with the stress of heart surgery. This was indicated in the literature review. Coping ability and style were measured in the pilot study through the use of the Maudsley Personality Inventory (MPI) (Eysenck, 1959), (see Appendix H). This brief self-report questionnaire offered a measure of coping ability in its Neuroticism scale, and a measure of coping style in its Extraversion scale. Descriptively, people who score high on Neuroticism are found to be emotionally overresponsive and to have difficulty returning to a normal state after emotional experiences. They are predisposed to develop neurotic disorders under stress and often manifest somatic symptoms. People who score high on Extraversion are found to be outgoing, impulsive, and uninhibited, while those who score low keep their feelings under close control. Both of these measures were suggested by the pilot study to be related to anxiety and pain scores. It should be noted that the Maudsley demonstrates good reliability and validity (Knapp, 1962). For instance, test-retest reliability coefficients were reported to range from .70 to .84 for the two scales of this test. Split-half and Kuder-Richardson reliability coefficients from many samples ranged from .73 to .90. Validity is also well documented in

several studies in several ways. For example, the MPI was able to significantly discriminate between groups nominated as high or low on the dimensions of extraversion-introversion and neuroticism-stability.

The first procedure used in this study to control these extraneous variables was elimination. The criteria for subject selection eliminated variance sources (including sex of the subject), with little sacrifice on generalization or results. The second procedure was group matching of subjects in the treatment and control groups. The control and treatment groups were equally divided between University Hospital and Veterans Administration Hospital patients. Since it would have been impractical, and very likely, impossible to match the two groups perfectly on all of the other variables, the two groups were "statistically matched" by comparing age, type of operation, the number of previous operations, and scores on psychological stress, coping ability, and coping style by the use of the tests just reviewed.

Other possible influences on the results were the patient's cooperation in listening to the tapes, his ability to respond to the tapes by relaxing, and his subjective response to the tapes. Thus, as described in the procedures section, the subjects were asked to rate how much they re-

laxed each time they listened to a tape. Their qualitative response to the tapes was also elicited daily by the researcher. These procedures constituted manipulation checks that served both as controls of extraneous sources of variance and subjective measures of outcome.

The final source of variance considered was the fact that a research assistant assisted this author by collecting most of the data from the patients at the Veterans Administration Hospital and by occasionally assisting at the University Hospital, as well. It was possible that patient responses would be influenced by the personality of the person collecting the data despite standardized procedures and forms. In order to control for such influence, all patients were mailed a questionnaire after their hospitalization. Embedded into questions about the stress reduction project were questions concerning their perception of the two different researchers (see Appendix I).

Data analysis. Analysis of the data began by comparing the measures of the independent variables across groups. This assured that the treatment and the control groups were equivalent and comparable. Next the dependent variables were considered. Although experimental hypotheses were generated for only two dependent variables, pain and anxiety, there were eight other measures collected on each patient to

supply more data for generation of hypotheses and a more complete analysis of the project. Of the ten outcome variables, nine were serial measures across the five days. The procedures of data analysis were as follows: First, the nine serial measures were subject to a principal components analysis across the five days within all forty subjects to reduce this data to its fundamental dimensions or principal components. It allowed elimination of data that were redundant or data that represented random effects. Next, correlation matrices for chosen variables that comprised the principal factors were generated and graphs of each variable across days by all the subjects were constructed. This was to assess whether or not a statistically predictable pattern of results across the five days could be generated for any of the principal factors (or dependent variables) for any subject. Then, all outcome measures including the serial measures that represented the principal factors (including pain and anxiety for hypotheses testing), the number of postoperative days, and the measures of subjective response (the manipulation checks) were tested by appropriate statistical procedures for the main effects between the treatment and the control group. The experimental hypotheses were tested at the .05 level of significance. Finally, the independent variables were compared with the outcome variables to complete the analysis of the data.

Design: assumptions and limitations of the methodology. This study was experimental in design (Kerlinger, 1973, 1979; Isaac and Michael, 1978). It investigated the effects of a treatment on an experimental group and compared the results to a control group that did not receive the treatment.

Evaluation of this study was based on a series of assumptions. First of all, it was assumed that the behaviors defined as the dependent variables reflected psychological and physiological stress reactions to the stressor experience of open heart surgery. Thus, dependent variables were chosen that were consistent with current theoretical definitions of stress and with prior research studies of surgical stress reduction. Preoperative measures were not meaningful in this study of postoperative recovery.

The second assumption was that measures of the dependent variables reflected differences in experimental variance not extraneous variance or error variance. To this end, a pilot study was performed to choose the dependent variables which would maximize the experimental variance. Control of extraneous variance was difficult, at best, due to limits of sample size and procedural separation of experimental and control subjects. A series of operations was performed including elimination of variance by selection criteria, the matching of experimental and control groups,

and the use of manipulation checks on variables indicated to be important to this study. This was far from the ideal of complete randomization, yet these procedures certainly sufficed to make this study worthwhile. The results allowed a knowledgeable evaluation of the treatment manipulation.

The minimization of error variance was brought about by reduction of measurement errors through controlled conditions and reliable measures. This highlights another assumption upon which evaluation was based, i.e. the conditions under which the behaviors under study occurred were relatively uniform and/or differences were accounted for in the control of extraneous variance. To this extent, it was assumed that all patients were exposed to relatively equal amounts and types of stressor experiences in undergoing open heart surgery and routine care in the hospital. The differences between University and Veterans Administration Hospitals' routine care were controlled by equal matching. The possibility of physiological complications and psychiatric care was controlled also. Thus, routine care was defined as the regular nursing care, including preoperative instruction, that all patients received prior to open heart surgery. It was possible that other experiences in the hospital, for instance, having a noisy roommate or a fight with one's spouse, could have influenced some dependent variables scores such as anxiety. In this study it was assumed that

such unusual differences in contemporary history were unlikely in the two groups of patients. The qualitative interview at the end of the study also allowed control for such unusual happenings.

The measures chosen for possible use all had a history of proven reliability in other studies and/or in the pilot study. The self-report measures were subject to the most problems. For instance, some people may have felt it "weak" in character to report pain or anxiety. The matching of groups on coping ability and style offered some checks on this problem of internal validity. Objective measures may also have been subject to problems such as the inconsistency in charting all medications. It was assumed that objective indices were for the most part, faithfully recorded in the patients' charts.

The external validity was assumed to be fairly good in this study. The selection biases in this study were few and the effects of experimental procedures were controlled. This study even incorporated two different hospital settings and populations. The subjects and experimental conditions are quite similar in many United States hospitals. Thus, the results of this study may be generalizable to other populations. Replication of this study would greatly increase the likelihood of this hypothesis.

In summary. This was an experimental study of a treatment aimed at reducing the stress of hospitalization for open heart surgery. A treatment group of twenty patients was compared with a twenty patient control group. The treatment was a series of audio cassette tapes of music, relaxation instructions, and the suggestion of positive expectancies for the outcome of surgery and the recovery period. The control condition was a tape of music alone. The dependent variables consisted of subjective and objective indices of stress recovery. A pilot study was used to decide upon the best choice of dependent variables and was also helpful in checking on sources of extraneous variance. The methodical procedures, assumptions, and limitations were discussed.

C H A P T E R IV

RESULTS

Introduction. This experimental study was designed to clinically evaluate a method of stress reduction for open heart surgery patients that employed the techniques of relaxation and suggestion of positive expectancies. This chapter presents a description of the results of this study. Topics covered include patient participation, population characteristics, comparability of groups, analysis of the dependent variables, and analysis of the independent variables.

Patient Participation

A total of sixty-four patients were approached to participate in this study from November, 1979 through May, 1980. Four people (six per cent) declined to take part in the study for personal reasons such as not experiencing stress and/or feeling that their own methods of stress reduction were adequate. Of the sixty patients who began the study, forty-three (seventy-two per cent) completed it. Four people elected not to complete the study: One in the treatment condition simply lost interest, two in the control condition did not like the music, and another in the control

condition became paranoid and hostile, believing that his medications were being manipulated. This patient was reassured, but not interviewed again. Thirteen patients (twenty-two per cent) were dropped from the study due to complications in their recovery that precluded daily interviewing or placed doubt in the comparability of their ratings. The most frequent complication (five people) was a delay for various reasons in removal of the breathing tube, which prevented interviewing on the first day of ratings. Other specific problems included incoherency due to postoperative delirium (two people), drowsiness due to medication on the first day of ratings (two people), and receiving renal dialysis twice daily (one person). Finally, one treatment patient and two in the control condition were transferred to hospitals not included in the study, and thus were unable to be followed.

Population Characteristics

The data collected for group matching allows a general description of the population. Patients averaged 55.5 years in age, ranging from 33 to 71 years old, with a standard deviation of 10.12 years. Almost all (92.5%) had no previous heart surgeries. The majority of the operations were cardiac arterial bypass (67.5%). Valve repair or replacement operations accounted for 17.5%, aneurectomies for 7.5%,

and a combination of procedures for 7.5%.

SRRS scores averaged 202.38, ranging from 65 points to 668 points with a standard deviation of 117.78 points. Neuroticism scores on the MPI averaged 18.53, ranging from 2 to 46 points with a standard deviation of 10.34 points. Extraversion scores on the MPI averaged 27.13 points, ranging from 12 to 38 points with a standard deviation of 7 points.

Comparability of Groups

In the review of the literature and the pilot study, certain variables were suggested to be possible sources of extraneous variance that may make the two experimental groups non-comparable. These included location, age, number of previous surgeries, type of operation, psychosocial stress levels, coping ability, and coping style. To ensure comparability on these variables, matching procedures were used. First, each group was perfectly matched by location, that is, each group consisted of ten University and ten Veterans Administration Hospital patients. The twenty out of thirty patients who finished the study in the treatment group consisted of ten University and ten Veterans Administration Hospital patients. Twenty-three patients finished in the control condition. Keeping in mind the goal of ten patients each on the location variable, two patients were

eliminated on the basis of missing data and one on the basis of occupation, a medical doctor.

Statistical matching was used for the other variables. The number of previous heart surgeries (NOPS) was divided into two categories, no previous heart surgeries and one or more previous heart surgeries. Type of surgery (TYPE) was classified as cardiac arterial bypass procedure, valve replacement or repair, aneurectomy, or a combination of procedures. The nominal data for these two variables was compared across the two experimental groups, with no significant differences found (refer to Tables 1 and 2). Psychosocial stress (STRS) was measured by scores on the Social Readjustment Rating Scale (SRRS) (Holmes and Rahe, 1967). Coping ability (COPE) and coping style (STYL) were measured by scores on the Neuroticism and Extraversion scales of the Maudsley Personality Inventory (MPI) (Eysenck, 1959). Scores on these three variables and age were compared across groups by t tests. No significant differences were found between the two experimental groups (refer to Table 3). An analysis of the independent variables' relationships with the outcome measures is presented later in this chapter.

Analysis of the Dependent Variables

Principal component analysis. The analysis of the dependent variables began with a principal component analysis of the

TABLE 1

Data and comparison of number of previous heart operations (NOPS), across experimental groups

Absolute frequency table

	NOPS		
	0	1 or more	
Treatment	18	2	20
Control	19	1	20
	37	3	n=40

x^2	d.f.	$p(x^2)$
0.00	1	1.00

TABLE 2

Data and comparison of the type of surgery across experimental groups

Absolute frequency table

TYPE

	Bypass	Valve	Aneurysm	Combination	
Treatment	14	4	1	1	20
Control	13	3	2	2	20
	27	7	3	3	n=40

x^2	d.f.	$p(x^2)$
.85	3	.84

TABLE 3

Data and comparisons of age, psychosocial stress (STRS), coping ability (COPE), and coping style (STYL), across groups

Variable	Treatment ($\bar{x}$)	(SD)	Control ($\bar{x}$)	(SD)	t	p(t)
AGE	55.15	11.54	55.90	8.76	.23	.82
STRS	202.00	150.68	202.75	75.95	.02	.98
COPE	19.60	10.58	17.45	10.25	-.65	.52
STYL	28.40	5.98	25.85	7.84	-1.16	.25

nine dependent variables that were serial measures across the five days within the two groups of subjects. The nine serial measures were pain, sleep, interest (in surroundings), self-care, strength (and energy), analgesics, sedatives, anxiety (STAI: Form X-1 scores), and temperature (number of days elevated).

The descriptive statistics for each variable across all five observations and the resulting component structure matrix are presented in Tables 4 and 5. The component structure matrix in Table 5 is based on an overall correlation matrix of measures across days and subjects. It could be argued that within and between subjects data should not be combined in this way, that a factor structure matrix based on scores between subjects might produce different sets of factors. This is unlikely for the following reasons. In order for the within subjects correlations to be different enough to suggest different factors, the distributions of scores for each of the five days would have to be separate; that is, the distribution of scores for each day would have to form discrete clusters of scores such that the distributions did not overlap to any substantial degree. Similar conditions would be necessary for the between subjects correlation to differ substantially from the overall pattern. Examination of the graphs (refer to Figures 1-4) of the scores for all subjects across the five days clearly

demonstrates that the distributions of scores between days and subjects overlap considerably. This is also supported in that the differences between means for each variable across all five observations are small relative to the standard deviations of the variables (refer to Table 4). Thus, it is concluded that the component structure matrix generated in Table 5 is a good representation of the data relevant to the questions asked in this research. Note also that this finding is consistent with the conceptualization of the multiple measures approach. That is, a pattern of associations between outcome measures was anticipated overall, not just within subjects or days.

The results of the analysis revealed that there are three principal factors which together accounted for 59.2 per cent of the variance. The variables which correlated most highly with factor one, which accounted for 35.2 per cent of the variance, were pain, interest, self-care, strength, and anxiety. It was suggested, therefore, that a single underlying dimension or factor was being reflected in all five variables. That is, as pain increased, so did anxiety, along with decreases in self-care, strength, and interest. The variables which correlated most highly with factor two, which accounted for 12.8 per cent of the variance, were the amount of analgesics and the number of sedatives taken by the patient. The variables which correlated

TABLE 4

Descriptive Statistics for Nine Dependent Variables

Variable	Mean	Standard Deviation
Pain	49.24	23.86
Sleep	62.80	27.45
Interest	57.36	28.61
Self-Care	46.32	27.07
Strength	45.60	24.69
Analgesics	9.11	7.88
Sedatives	.27	.53
Anxiety	34.88	10.13
Temperature	.45	.50

TABLE 5

Component Structure Matrix for Nine Dependent Variables

Variable	Factor 1	Factor 2	Factor 3
Pain	-.64	.18	.01
Sleep	.26	-.26	.75
Interest	.70	.27	.12
Self-Care	.76	-.30	-.05
Strength	.77	-.18	.02
Analgesics	-.32	.68	.00
Sedatives	.01	.75	-.01
Anxiety	-.71	.11	.04
Temperature	-.30	.32	.68

most highly with factor three, which accounted for 11.2 per cent of the variance, were sleep and the presence of elevated temperatures.

The results of the principal component analysis helped to reduce redundancy of measures and helped to suggest what factors were important and yet separate. It was now justified to reduce the number of serial measures subject to further analysis. Pain and anxiety were chosen to represent factor one as they also represented the dependent variables from which experimental hypotheses were generated. The variables pain and anxiety were found to be correlated with the other three variables in factor one at a significant level. Also, each of the five variables were approximately equally correlated with factor one. Given the fact that the correlations were significant, that there were a large number of observations (n=200), and that any combination of raw scores would provide, at best, a rough approximation of the true underlying factor, it was decided to use the most conceptually relevant and clear variables for further analysis, rather than a combination of scores which would be conceptually meaningless. A combination, or average, of scores would have also required conversion procedures, as not all the variables used the same scoring procedures. Given that the principal components analysis indicated all the variables to be statistically significant estimates of

the true underlying factor, this procedure should not compromise further analysis. Factors two and three were reduced to single items using a similar rationale. Analgesics were chosen to represent factor two and sleep was chosen to represent factor three. These variables were conceptually the most relevant and interesting to this study. Also, the scoring procedures for sedatives and elevated temperatures were seen as subject to more error variance than sleep or analgesics. Again, this arbitrary decision making process should not compromise further analysis.

Analysis for recovery patterns. Next, a correlation matrix for each of the serial measures was generated and analyzed. Low correlations among the serial measures for each variable suggested high variability on the day to day scores by each subject. Therefore, a statistical means of predicting score patterns across days on a given variable across subjects could not be derived. Figures of the results across days within groups were constructed for further examination and as a means of presenting the data in the most meaningful way (refer to Figures 1-4). Figures of the four variables chosen to represent the three principal factors demonstrated the lack of pattern across days. The obvious lack of a pattern displayed by the graphs of these variables across days and individuals was consistent with the low day to day cor-

FIGURE 1
Serial Measures of Pain Across Days

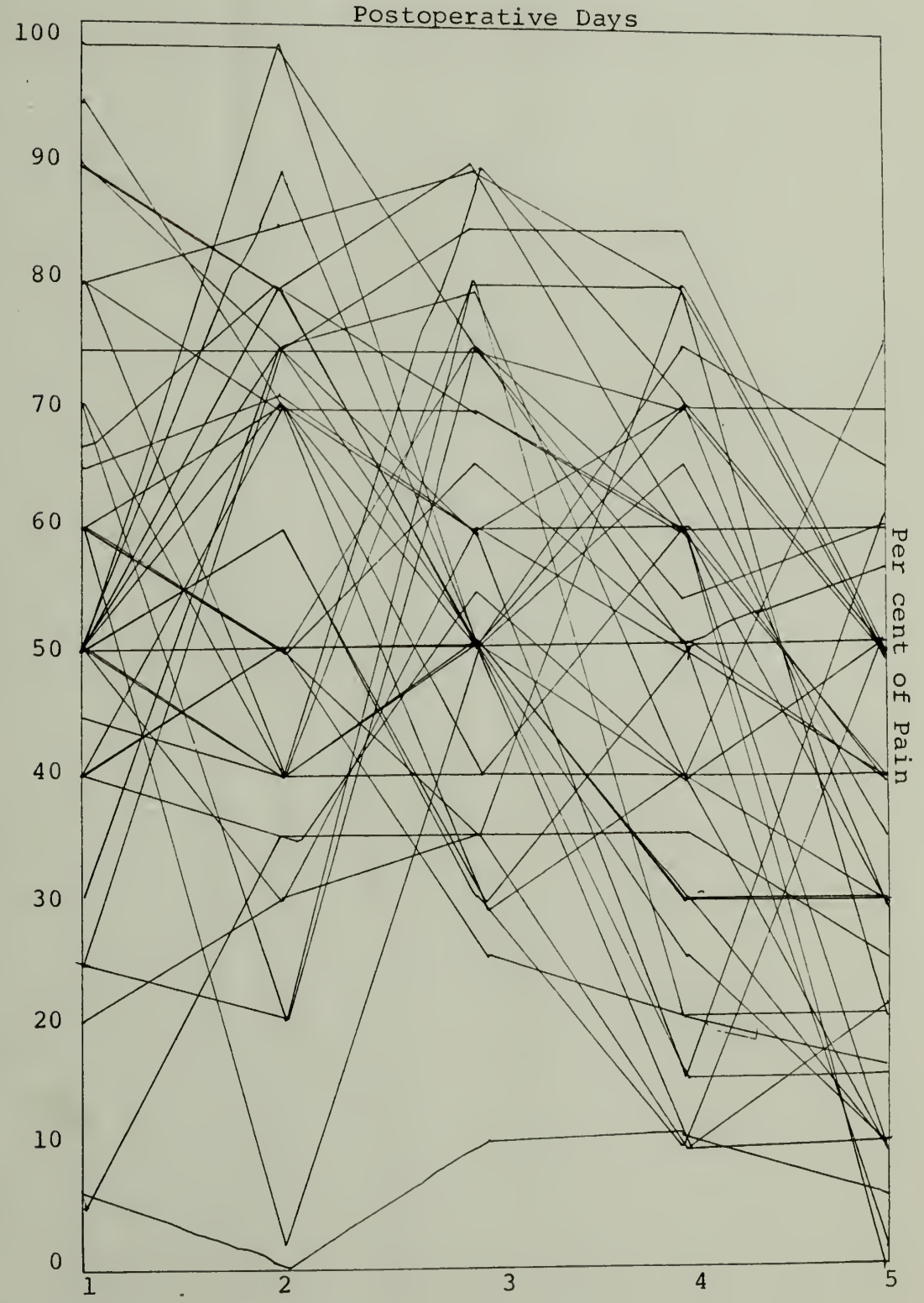


FIGURE 2
Serial Measures of Sleep Across Days

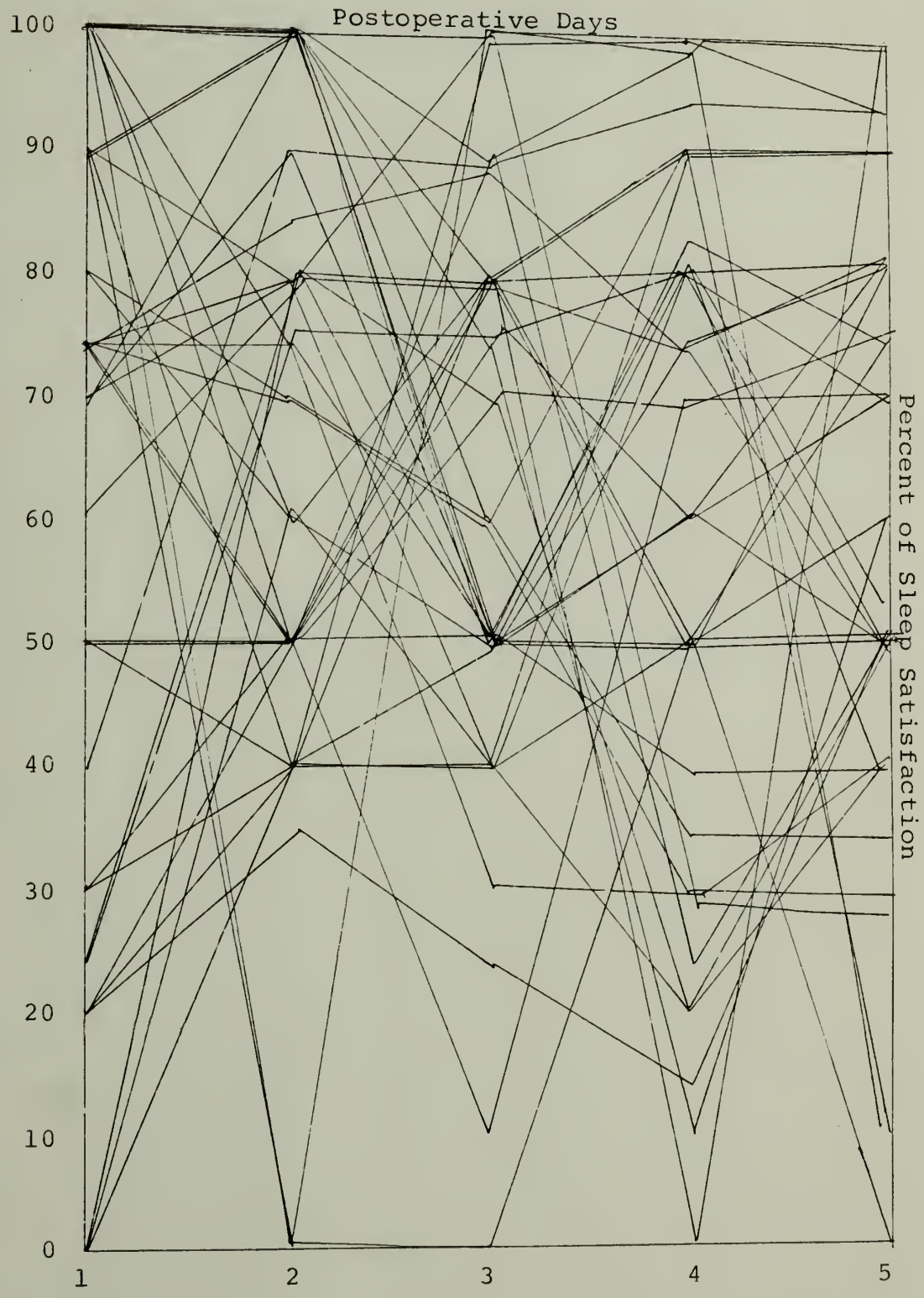


FIGURE 3
Serial Measures of Anxiety across Days

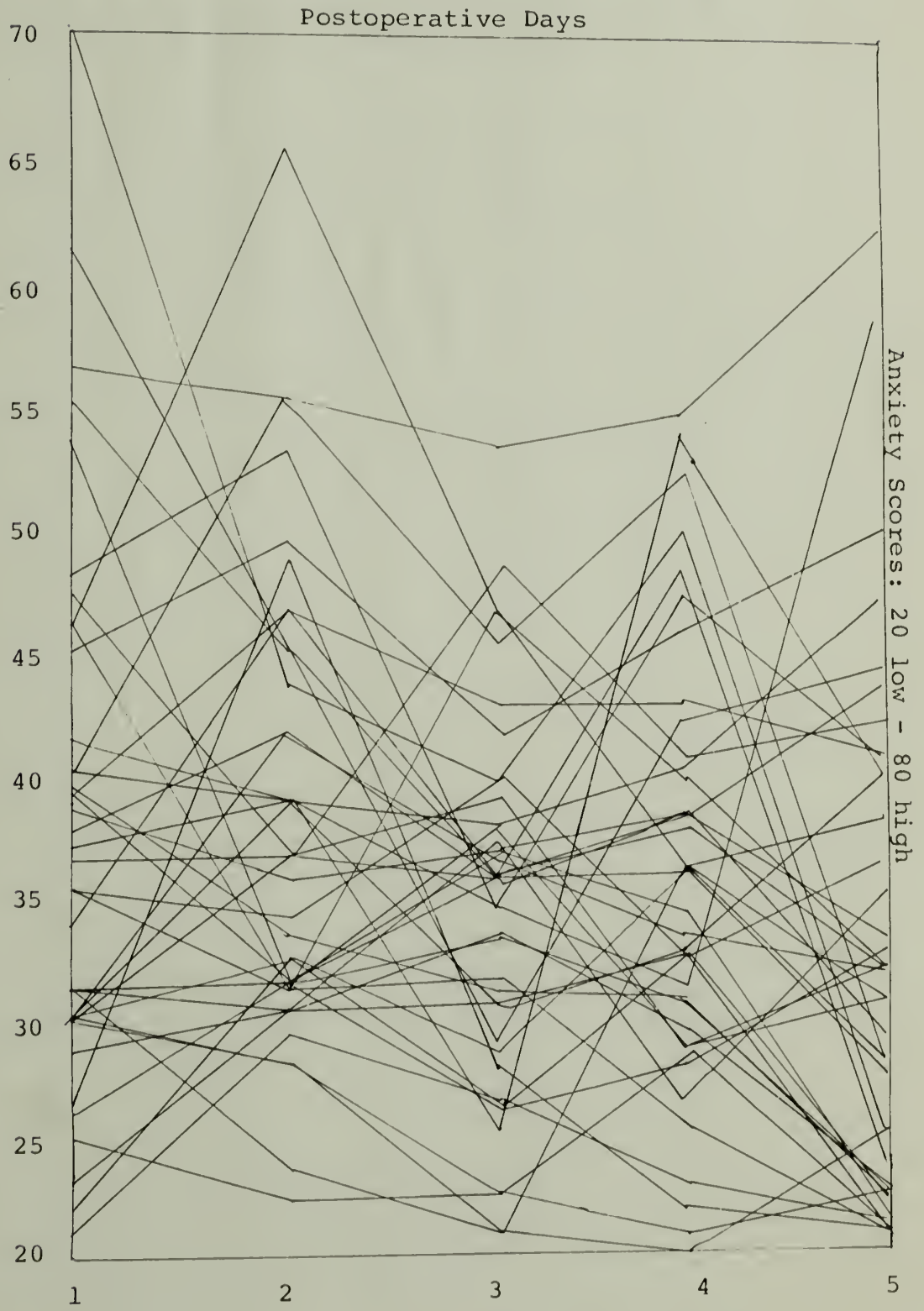
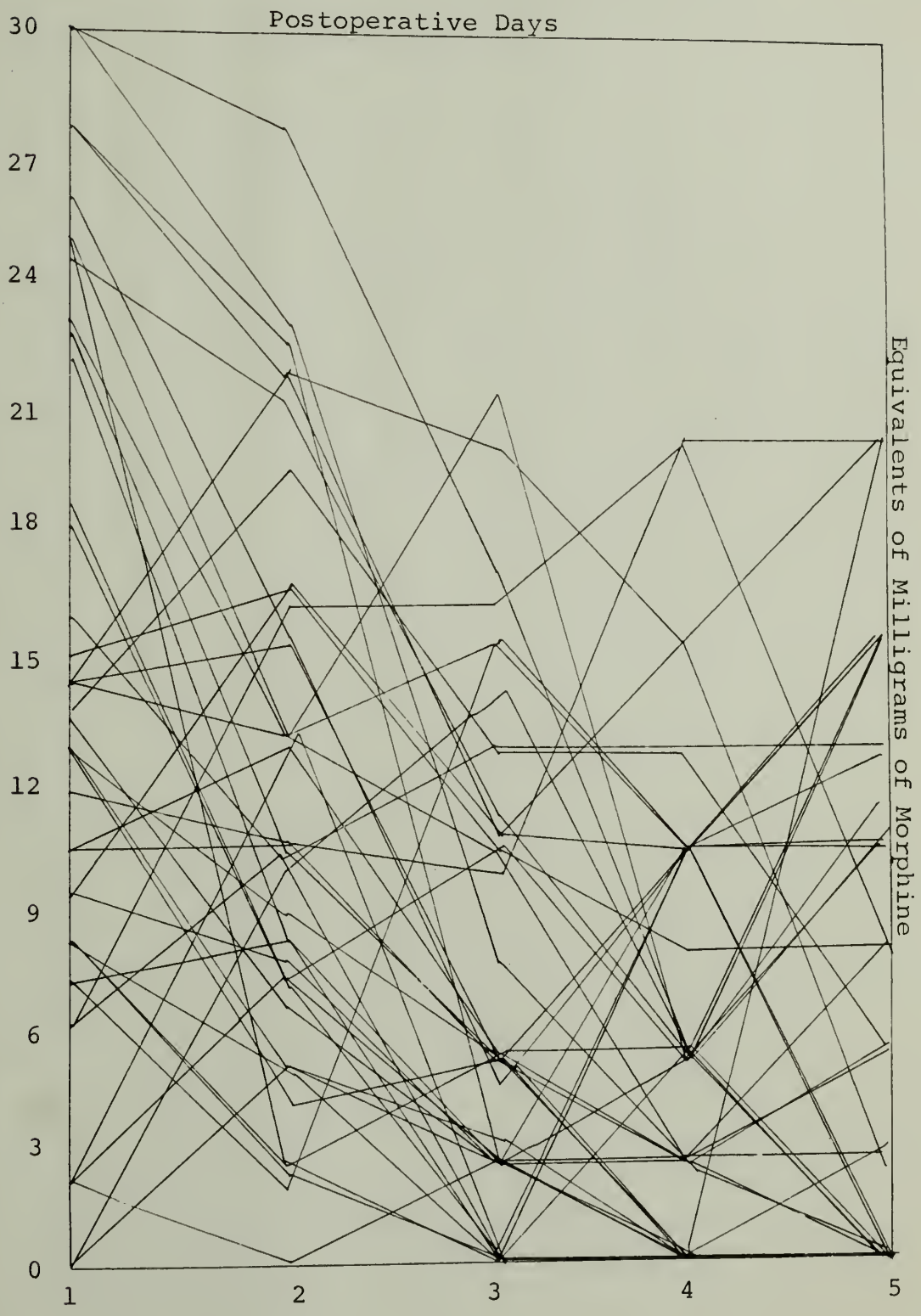


FIGURE 4
Serial Measures of Analgesics across Days



relations of scores for each of the variables.

It was concluded that the dependent variables considered here displayed no predictable pattern of recovery across individuals within or between groups over the time period considered. Therefore, in further analyses, each individual's serial scores were reduced to a set of four five-day means. This, in effect, treated the day to day variability in the serially measured variables essentially as random fluctuations about a constant underlying level. While this may have been a severe oversimplification in a longer time frame, there was no evidence in the data at hand to warrant other approaches.

Group main effects. Four of nine dependent variables were chosen for further consideration after the principal components analysis: pain, anxiety, analgesics, and sleep. These four variables plus the number of postoperative days (DAYS), the number of times listened to a tape (TIME), average relaxation rating (RATE), and overall subjective response to the tapes (RPNS) were compared for main effects across groups. The results are presented in Tables 6 and 7. There were two significant differences between the treatment and the control group. The ratings of pain were significantly less (α=.01) for the treatment group when compared to the control group. Specifically, the group mean for the

TABLE 6

Data and Comparisons of Seven Dependent Variables Across Groups

Variable	Treatment ($\bar{x}$)	(SD)	Control ($\bar{x}$)	(SD)	t	p(t)
Pain	43.15	15.84	55.34	12.21	2.73	.01 *
Sleep	66.18	17.69	59.42	14.10	1.31	.19
Analgesics	8.39	4.82	9.83	4.85	.94	.35
Anxiety	33.39	7.99	36.38	6.75	1.28	.21
Days	1.60	.18	1.35	.11	-1.59	.12
Time	6.65	3.16	5.45	2.09	1.42	.16
Rate	81.20	13.28	71.05	9.66	2.76	.01 *

* significance beyond .05

Scoring of Variables:

Pain: 0-100
Sleep: 0-100
Analgesics: equivalents of milligrams of morphine
Anxiety: 20 (low) - 80 (high)
Days: 1 (less than 9 days); 2 (ten or more days)
Time: average number of times listened to a tape
Rate: 0-100

TABLE 7

Data and Comparison of Subjective Response (RPNS), Across Groups

Absolute frequency table

	RPNS			
	Negative	Neutral	Positive	
Treatment	0	4	16	20
Control	3	7	10	20
	3	11	26	n=40

x^2	d.f.	$p(x^2)$
5.20	2	.07

treatment group was more than twelve points less than that of the control group. Also, the mean relaxation ratings were significantly higher (α=.01) when compared to the control group. Specifically, the group mean for the treatment group was almost ten points higher than the control group. There was a trend (α=.07) for the treatment tape to receive a better subjective response than the control tape. Specifically, in the treatment condition sixteen people (eighty per cent) had a generally positive response, and four people (twenty per cent) had a neutral response. In the control condition, ten people (fifty per cent) gave a positive response, seven people (thirty-five per cent) a neutral response, and three people (fifteen per cent) a negative response. An observation that was significant, although not across groups, was the fact that the number of times listened was approximately once a day rather than twice a day as originally planned and requested. Interpretation of this finding is held for the discussion section.

Other treatment effects. Variability scores could have been the subject of analysis for group main effects as well as the means. That is, did the treatment effect the variability of scores as well as the means. There were many hypotheses possible. However, unless something was evident in the graphs (refer to Figures 1-4), other hypotheses were not considered. There is no reason to reduce the number of

degrees of freedom by adding hypotheses without support of the data.

Hypotheses Testing

Having completed the analysis of the dependent variables by groups, the experimental hypotheses can be addressed.

It was hypothesized that the treatment group, in comparison to the control group, would:

1. Report lower daily levels of anxiety as measured by the STAI, Form X-1.
2. Report lower levels of daily pain as measured by the pain thermometer.

It was also hypothesized that the daily ratings of the treatment group, in comparison to the control group, would:

3. Improve at a faster rate as measured by the STAI, Form X-1.
4. Improve at a faster rate as measured by the pain thermometer.

The preliminary statistical analyses of the data demonstrated low correlations among the serial measures of pain and anxiety. The suggested high variability of day to day measures for each subject was supported by Figures 1 and 2 and thus it was concluded that the dependent variables of pain

and anxiety displayed no predictable pattern of recovery across individuals within or between groups over the time period considered. Thus, hypotheses three and four were unsupported by the data and not even subject to a useful test of significance.

Hypotheses one and two were tested by comparison of group means for pain and anxiety. Analysis of the data supported only hypothesis two, that is, the treatment group, in comparison to the control group, reported lower levels of daily pain as measured by the pain thermometer. The two groups did not differ in daily levels of anxiety as measured by the STAI, Form X-1 (hypothesis one).

Analysis of the Independent Variables

Introduction. The control of extraneous variables was a subject of great concern in this study. The results of the pilot study and the review of the literature suggested several variables that could directly influence the dependent variable measures. Thus, a careful matching procedure was devised. The treatment and control groups were not significantly different on any of these variables. Thus, it was concluded that the results of the study were not influenced by these variables. However, the question still remained as to how many of these variables were related and to what

degree they were related to the dependent variables. A post hoc analysis was performed in the following manner. The independent variables, location (LOCN), age, number of previous operations (NOPS), psychosocial stress (STRS), coping ability (COPE), coping style (STYL), and the manipulation checks, number of times listened to a tape (TIME), average relaxation ratings (RATE), and subjective response (RPNS) were all compared with the dependent variables. In addition the independent variables and the manipulation checks were all compared with themselves. The results are displayed in a correlation matrix in Table 8. Type of operation, the only independent variable not capable of interval scoring for the correlation procedures was compared with all the independent and dependent variables listed above in a separate analysis, the results of which are displayed in Table 9. The results of the comparisons of each independent variable are now presented.

Location (LOCN). Of all the variables, location, that is whether a patient was a University Hospital or a Veterans Administration Hospital patient, was perhaps the most strongly implicated in the pilot study as a possible source of variance. Therefore each group was perfectly matched to contain ten patients from each location. Post hoc analysis comparing location with the dependent variables readily supports that location was related to the outcome measures.

TABLE 8

Correlation Matrix of the Independent and Dependent Variables (n=40)

	PAIN	SLEEP	ANAL	ANXIETY	TIME	RATE	RPNS	DAYS	LOCN	AGE
LOCN	-33*	-33*	-29**	-35*	-10	0	-3	55*		44*
AGE	-16	24	-29**	-19	-30**	-14	-8	-4		
NOPS	-13	-3	-7	2	-12	-19	20	30**	-9	11
STRS	-4	6	8	20	18	-5	10	-17	-10	-25
COPE	5	-3	25	34*	14	10	16	17	0	-6
STYL	-7	25	5	6	29**	-3	27**	6	-10	-17
TIME	21	-7	13	6		18	38*	-5		
RATE	-20	13	-9	-36*			43*	-4		
RPNS	4	17	-15	-4				5		
	STRS	COPE	STYL							
NOPS	5	-20	-12							
STRS		45*	11							
COPE			24							

* significance beyond .05; ** significance beyond .10

TABLE 9

Data and Comparisons of Type of Operation with the Independent and Dependent Variables

Variable	Bypass ($\bar{x}$)	(SD)	Valve ($\bar{x}$)	(SD)	Aneurysm ($\bar{x}$)	(SD)	Combination ($\bar{x}$)	(SD)	F	p(F)
LOCN	1.44	.51	1.29	.49	2.00	.00	2.00	.00	2.82	.05*
AGE	2.33	.78	2.00	1.00	3.00	.00	2.67	.58	1.29	.29
NOPS	.11	.32	.00	.00	.00	.00	.00	.00	.49	.69
STRS	1.96	.81	1.29	.49	2.00	1.00	2.33	.58	1.89	.15
COPE	1.26	.45	1.43	.53	1.67	.58	1.67	.58	1.26	.30
STYL	1.56	.51	1.43	.53	2.00	.00	1.33	.58	1.13	.35
DAYS	1.52	.51	1.71	.49	1.00	.00	1.00	.00	2.65	.06**
TIME	1.56	.51	1.43	.53	1.67	.58	1.67	.58	.23	.88
RATE	1.59	.50	1.86	.38	1.67	.33	1.67	.33	.54	.66
RPNS	1.41	.89	1.29	.95	1.33	1.15	1.33	1.15	.04	.99
PAIN	47.79	15.93	52.29	16.28	58.07	1.62	46.40	15.96	.52	.67
SLEEP	60.33	17.47	63.43	10.29	77.07	18.70	69.33	3.51	1.17	.34
ANAL	9.19	5.13	8.23	3.69	13.20	5.47	6.33	1.46	1.14	.35
ANXIETY	34.47	8.05	37.51	5.11	33.47	11.32	33.87	1.67	.35	.79

* significance beyond .05; ** significance beyond .10

Pain, sleep, anxiety, and the number of postoperative days were significantly more favorable for University Hospital patients in comparison with Veterans Administration Hospital patients. The number of analgesics showed a trend towards less usage by University patients. Comparison of location with the other independent variables suggested that location was significantly related to age. That is, Veterans Administration Hospital patients tended to be younger than University patients. Location was significantly related to the type of operation. University patients made up 100 per cent of all aneurectomies and combination procedures, 44 per cent of the bypass procedures, and only 29 per cent of the valve procedures.

Age. The age variable was divided into three groups, forty-five years or less, forty-six to fifty-five years, and fifty-six years or more, and then compared with the dependent measures. Age was not significantly related to any of the outcome variables. There was a trend towards age being indirectly related to the use of analgesics. That is, the older patients used less analgesics than the younger patients. There was also a trend towards age being indirectly related to number of times listened to a tape. That is, the older patients listened to the tapes more often than the younger patients. Finally age was significantly related to one of the other independent variables, location. Veterans

Administration patients tended to be younger than University patients.

Number of previous operations (NOPS). The number of previous heart operations was divided into two categories, none, and one or more previous heart operations. There were only three patients out of forty that had had a previous heart operation, thus making a very small sample. This variable was not significantly related to any of the dependent or independent variables. There was one trend towards the number of previous operations being directly related to the number of postoperative days spent in the hospital. That is, those patients with previous operations were more likely to stay longer in the hospital postoperatively.

Psychosocial stress (STRS). Patient scores on psychosocial stress as measured by the Social Readjustment Rating Scale, were divided into three categories of stress: low (0-150 points), medium (151-250 points), and high (251 or more points). This variable was not significantly related to any of the dependent variables.

Coping ability (COPE). Patient scores on coping ability, as measured by the Neuroticism scale on the Maudsley, were divided into two categories based on normative data (Knapp, 1962): scores twenty points or below and twenty-one points or above. This variable was significantly related to one of

the dependent variables, anxiety. That is, people who scored twenty-one points or above on the Neuroticism scale were more likely to report more anxiety than those who scored twenty points or less. Also, this variable was significantly related to the independent variable psychosocial stress, that is, higher neuroticism scores were significantly related to higher psychosocial stress scores.

Coping style (STYL). Patients scores on coping style, as measured by the Extraversion scale of the Maudsley Personality Inventory were also divided into two categories based on normative data (Knapp, 1962): scores twenty-five points or below and twenty-six points or above. This variable was not significantly related to any of the dependent or independent variables. There was a trend towards coping style to be related to the number of times listened to a tape and subjective response. People who scored twenty-six points or greater on the Extraversion scale were more likely to have listened to the tapes and more likely to have had a positive response to the tape.

Type of operation (TYPE). The type of operation was either cardiac arterial bypass procedure (BYPASS), valve replacement and/or repair (VALVE), aneurectomy, or a combination of procedures. This variable was not significantly related to any of the dependent variables. There was a trend towards

type of operations being related to number of postoperative days. All patients who had either an aneurectomy or a combination procedure were in the hospital nine or fewer days postoperatively. Patients who had a bypass procedure were approximately equally likely to stay nine or fewer or ten or more days postoperatively. However, seventy-one per cent of those patients who had a valve procedure stayed ten days or more.

Type of operation was significantly related to one of the independent variables, location. University patients made up 100 per cent of all aneurectomies and combination procedures, 44 per cent of the bypass procedures, but only 29 per cent of the valve procedures.

Number of times listened to a tape. The number of times listened to a tape was divided into two groups, five and less and six and more, for purposes of comparison. It was significantly related to only one dependent variable, subjective response. The more positive response to the project a patient had, the more likely he listened six or more times to the tapes.

This variable was not significantly related to any of the independent variables. There was a trend towards the number of times listened to be positively related to coping style and positively related to age. People who scored

higher on extraversion were more likely to listen to the tape. People who were older were more likely to listen to the tape.

Relaxation ratings. Mean scores on the relaxation ratings were divided into two groups for the basis of comparison, seventy per cent and below, and seventy-one per cent and above. Relaxation ratings were significantly related to scores on anxiety, that is, higher average relaxation scores were associated with lower anxiety scores. Relaxation ratings were also significantly related to subjective response, that is, higher relaxation ratings were associated with a more positive response by patients. Relaxation ratings were not significantly related to the independent variables.

Subjective response. Patients' subjective responses were classified as either negative, neutral, or positive, based on patient comments during and after the study. Subjective responses were significantly related to only two of the independent and dependent variables, number of times listended to a tape, and average relaxation ratings. A more positive response to the project was associated with greater number of times listened to a tape and higher average relaxation ratings.

CHAPTER V

DISCUSSION

Discussion of Patient Participation

Patient participation in this study was extremely good. Only six per cent of all patients approached declined to participate. In most cases, this occurred with patients who reported that they used their own methods of systematic relaxation or self-hypnosis. Of the sixty people who started the study, only a few lost interest, mostly due to a personal dislike of the control condition music. Most of the patients who did not complete the study were disqualified by the researcher. Many of them listened to the tapes even though they were not asked for ratings. One of the patients was transferred to a hospital that was not part of the study, and insisted on taking a copy of the music tape with him. It is concluded that most patients are interested in this type of stress reduction program. This finding is consistent with one of the project developmental guidelines stated in chapter two, that is, the method of stress reduction must be acceptable to the patients. Another implication of the excellent patient participation is that the volunteer effect in patient selection is minimal for this study.

Discussion of Population Characteristics

Data collected for the purpose of group matching supplied a description of the population in terms of the independent variables. In general, the hospital serves approximately equal numbers of Veterans and University Hospital patients in performing the four types of open heart surgery studied: cardiac arterial bypass, valve replacement and/or repair, aneurectomy, or a combination of procedures. Most patients (67.5 per cent) were scheduled for a bypass procedure and had no history of previous surgeries.

The range of ages was quite wide, from thirty-three to seventy-one years, averaging fifty-six years of age. These patients appeared to represent a somewhat normal population in terms of coping ability and style as measured by the Maudsley Personality Inventory. The norms and standard deviations are similar to those of normal populations as listed by Knapp (1962) in the Maudsley manual. Finally, the psychosocial stress scores as measured by the SRRS were quite varied, averaging 202 points. This average suggests a moderate stress level, but fifty-three points of each patient's score applies to their heart problem. This population appears somewhat average in terms of psychosocial stress events for the previous year.

In conclusion, these data do not offer any information that is immediately distinquishing of this group. That is, the group is not particularly representative of any one hospital or age group. The group is not particularly neurotic or extraverted, or heavily stressed in terms of life events in the previous year. The most distinquishing characteristic was that most of the patients were having their first operation and it was most likely a bypass procedure. Thus, these data will have little bearing on the rest of the discussion except to say that in some ways it is a normal population of people who are also having heart surgery. A more detailed and perhaps enlightening comparison of these data with other populations is outside the main focus of this study.

Discussion of the Comparability of Groups and the Independent Variables

The control of extraneous variance in this study centered on controlling the influence of eight variables by a matching procedure. The two experimental groups were not found to be significantly different on the variables of location, age, number of previous operations, type of surgery, coping ability, coping style, or psychosocial stress in the previous year (refer to Tables 1-3). Thus, it was concluded that the treatment group and the control group

were equivalent and comparable. This supported the assumption that the measures of the dependent variables reflected the differences in experimental variance rather than extraneous variance.

A post hoc analysis was performed to explore the issue of just how many and to what degree the independent matching variables really were related to the outcome measures (refer to Tables 8 and 9). The results of the analysis, presented in the last chapter, will now be discussed for each of the independent variables.

Location. Location was found to be significantly related to pain, sleep, anxiety, and the number of postoperative days. There was a trend towards the use of analgesics being related to location. In all cases, University Hospital patients had the more favorable scores, that is, less pain, better sleep, less anxiety, fewer postoperative days, and less use of analgesics.

Why should location be such a large influence? Are the two hospital populations different or are the settings different, or is it a combination of the two factors? Setting may partially account for the results, but a post hoc analysis of the data revealed that on the average, all patients spent the first three days of the five observation days in the ICU at University Hospital. The biggest difference in

setting is that V.A. Hospital patients had to be transferred by ambulance from the University Hospital to the V.A. Hospital as soon as they were ready to leave the ICU. This trip may be a stress that affects outcome variables. Also, V.A. Hospital wards on the average were observed to have more patients in a room and less nursing coverage per patient.

To help suggest patient characteristics that may influence results, the two groups were compared with the other independent variables and the manipulation checks, including age, type of operation, number of previous operations, psychosocial stress, coping ability, coping style, the number of times listened to a tape, average relaxation ratings, and subjective response to the tapes. Only age and type of operation were significantly related to location. V.A. Hospital patients on the average were younger than University Hospital patients. Increasing age was indicated in the literature review to be related to a poorer postoperative recovery. Age in this study was not significantly related to any of the outcome variables. Thus, this is not considered a useful finding for interpretation of the difference in outcome scores for the two populations.

Comparison of type of operation revealed that V.A. Hospital patients had seventy-one per cent of the valve operations, fifty-six per cent of the bypass procedures, and no aneurectomies or combination procedures. Valve patients did

spend longer periods of time in the hospital postoperatively (refer to Table 9). While this finding may at first appear to help explain why location is related to postoperative days, further analysis does not lead to this conclusion. Of the seven patients who had valve operations, five were hospitalized longer than ten days, and four of these five were V.A. Hospital patients. However, a total of fifteen V.A. Hospital patients as compared to only four University Hospital patients were hospitalized for more than ten days.

There is also a methodological issue that could conceivably be related to difference in location. For the most part, when patients were at the V.A. Hospital, a research assistant conducted the daily interviews. It is possible that patients were likely to report how they felt in a different manner, depending on who interviewed them, especially since the researcher is male and the research assistant is female. However, this appears to be a doubtful influence since the male researcher was also involved with the V.A. Hospital patients when they were at the University Hospital, an average of three of the five postoperative days included in the study. Furthermore, the research assistant also interviewed and took ratings from most of the University Hospital patients as well, as she was responsible for weekend coverage at both hospitals. Finally, patient per-

ceptions of the two different people were assessed in the follow-up questionnaire (refer to Appendix I). Ratings on understanding, sympathy, and being personable were all favorable and equal for the two researchers.

The question still remains, what accounts for the significant difference in outcome variables across the two groups of patients. Reviewing the significant differences, postoperative stay is believed to be influenced mostly by hospital policy. Inquiry by the researcher into this phenomenon resulted in two different unverified answers. One resident suggested that the V.A. Hospital gets paid for full beds. Others felt that the V.A. Hospital had the economic luxury of keeping its patients longer to insure total recovery before discharging them.

The trend towards more use of analgesics may partially reflect differences in hospital policy and ward procedures as well. The differences in sleep ratings may be partially explained by the disruption of being transferred between hospitals and the larger wards of the V.A. Hospital. Differences in pain and anxiety ratings may also reflect the increased disruption and less attentive V.A. Hospital atmosphere, with perhaps increased anxiety and/or general suffering.

It is concluded that differences in the two hospital populations on outcome variables are probably most influenced by the differences in the two hospitals, such as ward care, transfers between hospitals, postoperative care policies, and the resulting influence of such factors on the patients. The differences in the two populations is in need of greater study to provide more definitive answers to this problem. There may be other patient characteristics not covered in this study that influence the results.

Age. Age was not significantly related to any of the outcome variables. There were trends towards older patients using less analgesics and listening to the tapes more often. Age was significantly related to location also, with the V.A. Hospital patients tending to be younger. Since V.A. Hospital patients significantly used more analgesics, perhaps location is more important than age in explaining the greater use of analgesics by younger patients.

The data collected in this study offers no hypothesis as to why older people tended to be more compliant or were more likely to be offered the tape by the ICU nurses. Previous studies have noted age to be unrelated to recovery (Rakoczy, 1977), unrelated to mortality (Heinrichs, 1969), and to be directly related to the incidence of post cardiac delirium (Elsberry, 1972). The results of this study are not inconsistent with these prior findings. It is con-

cluded, however, that age would not have been a great source of extraneous variance in this study.

Number of previous operations. This variable was not significantly related to any of the independent or dependent variables. There was a trend towards patients with previous operations to stay in the hospital longer postoperatively. Perhaps patients who were having their second operation were subject to more physical difficulties both during the operation (cutting through scar tissue) and during recovery, thus necessitating a longer amount of intensive care. It may be that they were just in worse physical condition overall, in that they required a second operation. However, it is noteworthy that the number of previous operations was unrelated to other outcome variables. The extremely small sample size of patients having previous heart operations (three out of forty) limits any generalizations or conclusions about this variable. It would probably not have been a great source of extraneous variance in this study.

Psychosocial stress. Psychosocial stress scores were not significantly related to any of the outcome variables, even though they were suggested to be related to pain and anxiety scores in the pilot study. The increase in sample size from twelve (in the pilot study) to forty in the final study, offers a better sample from which to draw conclusions. Perhaps the best understanding of this result is that the

stress of heart surgery (as measured in the first five post-operative days by the outcome variables in this study) was greater than the psychosocial stress of the past year that was measured by the SRRS. It is more likely that SRRS scores might be related to physiological events that resulted in a heart operation. Prior studies have related SRRS scores to physiological disorders including myocardial infarction (Rahe and Paasikivi, 1971; Theorell and Rahe, 1971). It is concluded that psychosocial stress (SRRS source) would not have been a great source of extraneous variance in this study.

Coping ability. Scores on coping ability (Neuroticism) were significantly related to anxiety scores. This result is logically consistent as people who are more neurotic, as defined by the Maudsley Personality Inventory (Knapp, 1962), are those who are inclined to worry and thus be anxious. This result supports the idea that coping ability would have been a source of extraneous variance in this study.

Coping style. Coping style was not significantly related to any of the dependent variables. There were trends towards patients who scored higher on Extraversion to have listened to the tape more and to have a more positive response to them. Extraverted people are defined as more sociable (Knapp, 1962). This trait perhaps also indicates a greater

need to cooperate with the study as well as a greater positive response to the suggestions of others. However, subjective response and times listened to a tape were not related to the other outcome variables. It is concluded that there is little to support the idea that coping style as measured was a variable worth assessing and controlling for in this study.

Type of operation. This variable showed only a trend towards being related to the number of postoperative days. The relation of this variable to postoperative days was previously and adequately interpreted in the discussion of the variable, location. Briefly, type of operation was also significantly related to location. It appears likely that it was the high number of V.A. Hospital patients in the category of valve procedure that accounted for the increased likelihood of people who have valve procedures to have a longer postoperative hospitalization. It is concluded that this variable was unlikely to have influenced the outcome measures even if it was not controlled by a matching procedure.

The manipulation checks. As independent variables, the manipulation checks produced only one significant comparison with the dependent variables. The ratings of anxiety were significantly lower for those patients who reported higher relaxation ratings after listening to the tapes. This may

be interpretated to reflect the beneficial effects of the tapes. Relaxation ratings were also significantly related to subjective response and subjective response was significantly related to number of times listened to a tape. That is, people who had a more positive response to the tapes, also tended to listen to the tapes more and report better relaxation ratings. However, lower anxiety scores may also reflect personal characteristics of patients who have more ability to relax or who are more naturally relaxed. The interaction of ability and response was not evaluated in this study, but is deserving of future investigation. The only other study found in the review of the literature that used tapes for surgery patients (Fields, 1974), suggested that personal ability may be a factor influencing the results of such studies. Unfortunately, relaxation ratings are not necessarily a true indicator of ability.

In conclusion, relaxation ratings appear to have been worthy of study as a variable. It was related to anxiety ratings as an independent variable. Also, it was related to the treatment intervention as a dependent variable, that is, the treatment group reported significantly better relaxation ratings. The influence of ability to relax as an individual characteristic is deserving of further study. Did an individual's positive attitude towards the study lead to

better relaxation ratings and a greater frequency of use of the tapes? Or, did a greater ability to relax lead to a more positive valuation of the tapes? Further research is needed to answer these questions.

Summary. Of all the possible sources of extraneous variance controlled for by matching procedure in the study, location appears to have been the most important. It was significantly related to four of the outcome measures and showed a significant trend toward being related to a fifth outcome variable. The influence of location appears to be mostly related to the hospital settings, and the differences in patient care policies and procedures rather than to individual characteristics as measured by the study. The question of individual characteristics that may differentiate the two hospital populations is still open to question, but beyond the scope of the study. The number of previous operations, type of operation, psychosocial stress, and coping style were not found to be significantly related to any of the outcome variables in the post hoc analysis of the data. Coping ability was related to one variable, anxiety. Finally, it was noted that relaxation ability is a variable worthy of future study.

Discussion of the Principal Components Analysis

The principal components analysis of the nine serial measures produced three factors which together accounted for 59.2 per cent of the variance (refer to Table 5). It is important to try to understand the nature of these three factors. The measures that correlated most highly with factor one, pain, self-care, strength, interest, and anxiety include all but one of the daily self-ratings, and that one is sleep. These five daily ratings may be interpreted to be asking the general question, how do you feel today? This may be a good estimate of the underlying dimension or factor associated with these separate questions that allows differentiation of factor one from factors two and three. The amount of analgesics and use of sedatives were the measures that correlated most highly with factor two. This may be interpreted to represent an interaction between the medical staff's typical procedures and their assessments of the patient's needs. Medications are often prescribed somewhat routinely as part of an operative procedure, i.e. heart surgery is painful and morphine is routinely administered. Also, staff observations of behavior often determine medication dosage, e.g. a patient may not be given medication that is prescribed "as needed" unless they are aware of its availability and then ask for it. Patients who complain a lot may get different amounts of medication than those who

suffer in silence.

The ratings of sleep and the incidence of elevated temperature are the variables that correlated most highly with factor three. This factor is not as easily subject to interpretation as factors one and two. Ratings of sleep (the previous night) are influenced by many factors such as the patient's physical condition after surgery. They must be able to sleep in a strange place often with wires, tubes, and machines attached to them, and often with interruptions by staff for medical monitoring or other procedures. One speculation as to the relationship of ratings of sleep satisfaction to the incidence of elevated temperatures is that the underlying factor involves dysfunction of the patient's self-regulatory systems. Sleeping and temperature regulation are both related to the body's autonomic nervous system functioning. Also, physical distress that involves elevated temperatures or other complications may also lead to increased sleep disturbance due to increased medical monitoring and care during the night.

Implications. The results of the principal components analysis justified reducing the number of serial measures subject to further analysis, as each variable in a given factor was judged to be reflecting a single underlying dimension or factor. That is, each measure represented the same information. Pain and anxiety were chosen to represent factor

one, as they also represented the dependent variables from which experimental hypotheses were generated. Analgesics was chosen to represent factor two and sleep was chosen to represent factor three.

The principal components analysis also offers guidance for choosing and designing measures for future research by helping to reduce redundancy and by helping to separate different factors. The most obvious implication in the study was the overlap of the daily self-ratings and separation of sleep ratings from the other five ratings.

Discussion of the Analysis for Recovery Patterns

The analysis for recovery patterns involved the generation and analysis of a correlation matrix for the serial measures and the construction and analysis of figures of the scores of the serial measures across days within groups (refer to Figures 1-4). The results indicated that the serial measures considered displayed no predictable patterns of recovery across individuals and within or between groups over the time period considered. A statistical means of predicting score patterns across days on a given variable could not be derived.

Interpretation. The lack of a consistent individual pattern for any outcome measure across days suggests that recovery after heart surgery as measured by the dependent variables in this study may be a highly individual process that is complex in nature. Indeed, this variability was verified by subjective observations of the researchers during the study. The first day after surgery some patients were observed to be lethargic and fatigued, while others were somewhat euphoric at having survived the operation. Some patients appeared to be more comfortable as time went on and others appeared to become more aware of their discomfort as the effects of heavy medication wore off in the days after the operation. Half of the sample population of the patients was transferred from the University Hospital intensive care unit (ICU) to the Veterans Administration Hospital, usually about one to three days postoperatively. It was thought that perhaps this group had a different pattern that was distorting the data. However, separate analysis did not support that hypothesis. One possible explanation is that the period of sampling, the first five postoperative days, is just too short a period from which to isolate a pattern of recovery.

Implications. The results suggest that each individual's recovery in this study is best represented by the means of the scores for the five days. That is, the day to day

variability in the serial measures was essentially random fluctuations about a constant underlying level. This suggests two hypotheses to explain any difference in the experimental group on the outcome measures. One, the groups differed from the beginning. This hypothesis is not supported in light of the matching procedure and the subjective comments made by the patients. The second hypothesis is that the experimented manipulations had an immediate and sustained effect. This hypothesis is accepted in light of the previous comments.

Discussion of the Analysis of the Group Main Effects

Evaluation of the treatment effect in this study centered on the results of the analysis of group main effects. Pain, anxiety, sleep, analgesics, the number of postoperative days, and the three manipulation checks, number of times listened to a tape, relaxation ratings, and subjective responses were compared across groups (Refer to Tables 6 and 7).

Pain. The ratings of pain were significantly less ($\alpha = .01$) for the treatment group when compared to the control group. Specifically, the group means differed by more than twelve points. Why did the treatment tape prove to be more effective than the control tape in reducing pain? There were at least three qualities of the treatment tape that could

account for this. As a specialist in pain control, this author believes that the crux of pain is not the sensation itself, but a person's reaction to that sensation, which at its worst is called suffering. One factor that directly effects pain is how a person physically reacts to the uncomfortable sensation. The usual and unfortunately most undesirable reaction is to increase muscular tension which usually serves to increase the pain. Responding to pain with physical relaxation of muscles may relieve pressure around the wound and increase blood flow to the wound to result in a decrease in the sensation of pain. The treatment tape had specific instructions and suggestions for general relaxation, including muscular relaxation in response to discomfort and most specifically, for relaxation of the chest area, and the breathing process. Thus, the differences in pain ratings between the two groups could be due to greater effectiveness of the treatment condition in producing relaxation, especially muscular relaxation of the chest area and the breathing process. Comparisons of the relaxation ratings of the two groups did show a significantly better rating ($\alpha = .01$) of relaxation for the treatment group by more than ten points. Subjective comments by patients verify this as the treatment tape was often described as very relaxing, soothing, and helpful. One patient related to the researcher that he remembered to "relax and breathe" when he woke up in the ICU.

A second factor that may help explain the treatment effect is that a person's psychological reaction to a sensation of discomfort includes cognitive interpretations of the stimulus. The treatment tape had specific suggestions to interpret many uncomfortable sensations as normal, and as related to the healing process, such as in coughing exercises. Some suggestions were also given for reinterpretation of persistent discomfort into feelings of numbness. Finally, pain is a psychological event involving other's responses to a person's suffering behavior. The treatment tape offered a personal touch, personal counseling in times of stress. Many patients mentioned how important it was to think that someone cared enough to develop and supply them with the tapes. Thus, pain scores may have been affected by the treatment tape which had an abundance of suggestions that directly applied to pain.

Anxiety. Although the group means for anxiety were more favorable for the treatment group, the differences between groups did not quite reach significance (α=.21). Although anxiety and pain were both highly correlated with factor one, there is obviously at least some small difference between what is being measured by the two variables. Anxiety is often considered a component of pain, but as just discussed in the previous section, pain involves sensation and suffering components as well. Also, it is possible that

the music was just as effective as the suggestion tape in reducing anxiety. Having a third group that receives no tape at all for comparison would help answer this question. This data is currently being collected.

Sleep. Although the mean scores on sleep ratings are more favorable for the treatment group, this rating was also not significant. Sleep satisfaction may be related to overall physical condition and perhaps most importantly, to hospital care practices which includes frequent interruptions and continued machine monitoring in the ICU. However, it is likely that sleep ratings were influenced by the tapes as subjective evaluations of both the treatment and control tapes repeatedly included comments about the benefits of the tapes for sleep. Perhaps music and suggestions are effective for sleep. Again, a no tape condition will help answer this question. Perhaps the subjective comments applied only to helping to get to sleep, not sustaining it, or to daytime sleep rather than nighttime. The current data do not allow clarification of the issue.

Analgesics. The use of analgesics was not significantly different for the two groups. This may be due to the fact that medication usage is primarily determined by routine medical procedure and nursing discretion rather than by patients themselves. It was often observed that some

patients expressed a dislike for medication effects while others wanted more medication than they were given.

Postoperative days. The total number of postoperative days also failed to show any significant differences between groups. It appears that the treatment intervention did not readily affect recovery in this way. Referring to Table 6, it is noted that those in the treatment group showed a weak trend (α=.12) towards spending longer periods in the hospital than the control group. No explanation is offered for this finding from the data of this study. Postoperative hospitalization appeared to be at least partly affected by routine hospital care to a certain extent as was reflected in the differences between University and Veterans Administration Hospitals.

Number of times listened to a tape. The treatment did not appear to effect use of the tapes. In fact, people listened to the tapes only once per day rather than twice daily as requested. This was inconsistent with the generally positive subjective comments about the program. The decreased frequency in listening was probably due to many factors. The evening prior to surgery was often too occupied with lab tests, visits by family and friends, and consultations by various medical personnel to allow the patient time for more than one listening. Also, on the average, most patients spent the first three postoperative days in the intensive

care unit (ICU), where they were dependent on nursing staff to play the tapes. Nursing staff enthusiasm varied, and more interest was shown during the first half of the study (control condition) than during the second half (treatment condition). Perhaps this explains the slightly higher frequency of use of the tapes by the control group. Other factors which affected nursing participation included how busy the nursing staff was at any given time, and overall morale of the staff which was observed to vary in relation to the overall welfare of the patients. One implication of this finding is that great care should be taken to impress upon the nurses the credibility and value of the use of such tapes. The nursing staff's beliefs and attitudes are probably instrumental to the frequency of use and a strong influence on patient response. It is concluded that the frequency of use of the tapes was not a good indication of the treatment effect.

Relaxation ratings. Relaxation ratings were significantly better (α=.01) for the treatment group in comparison with the control group. Thus, specific suggestions for relaxation is seen as more effective than music. The relaxation ratings for both groups were generally high averaging 76 on 0-100 scale.

Subjective response. There was a trend (α=.07) for the treatment group to have a more positive response to the tapes than the control group (refer to Table 7). The treatment condition was described with such words and phrases as well done, mellow, peaceful, relaxing, beneficial, restful, a good idea, useful, etc. There were some reactions such as, "I was doubtful at first, thought it was a gimmick, but later I found I liked the suggestions. I remembered to relax and breathe." Another man, whose response was neutral at first as he, "Practiced his own self-hypnosis", expressed frustration when his headphones failed to work properly one day. The response to the control condition (music tapes) was also generally favorable. Comments were often more specific, such as how it helped them to sleep, to decrease boredom, or to decrease anxiety or pain. Comments included the following: "I absorb music - ignore pain.", "I'm an elevator music man.", "It (music) captures your mind...music has a certain harmony...depth within you.", "Anytime I began to get overwhelmed by pain or anxiety or my own thought processes, I used this (tape) to take myself out of it and get a rest or a nap." Many comments were made both in the interviews and in the questionnaires about the desire for different kinds of music for the control tapes. People seemed to have their own preferences including country western, Hawaiian, big band, jazz, Viennese waltzes, and even

"singing arias of operatic knowns". In general, people liked the idea of having music available, but wanted more variety and selection.

Patient response, in general, was positive for all the tapes. Many felt it was a good idea. Two people offered to help the author make tapes. One wanted a copy of the entire research protocol to take to Florida (his home state) with him. Even people who were not pleased by the particular music chosen for the control tape liked the idea of having the tapes. One man who was transferred to another hospital was quite upset and requested a copy of the tape to take with him. The most amusing anecdote occurred when a man managed to take his tape recorder with him to the operating room where he asked the anesthesiologist to play the music tape as he started his procedure. Some people were specifically impressed with Dr. Copeland's (the surgeon) introduction (on the first tape) because they felt it extended his involvement. In general the surgeon's involvement in providing an introduction on the first tape was quite powerful. Perhaps it would be best if the surgeon made the entire tape. The power and trust given to this person by the patients is extraordinary.

Another source of data was the follow-up questionnaires. The comments from the follow-up questionnaires (33 out of 40, 82.5 per cent, were returned) were also highly

favorable. Many people mentioned the specific usefulness of the tapes for sleep. Others reflected on the "caring" element of the project. One man wrote, "knowing that someone else knew that I was in a position to need something to relax and went to the trouble to put them together 'cause they cared also helped me a lot, thanks". Another wrote, "...very useful, as this was my first operation of any kind and I was very nervous at first...the tapes offered me a chance to relax".

In summary, patient response was considered favorable due to a number of factors, including the high rate of subject participation in the project, positive comments both during the study and on the written questionnaires after the study, and the generally high relaxation ratings in response to the tapes. The treatment condition was generally considered to be received better than the control condition.

Conclusion. It is concluded that the treatment tape was more effective than the control tape in reducing pain, most likely due to its specific relaxation effects, including muscular relaxation, its cognitive strategies for dealing with pain, and in its expression of personal caring. It also appeared to be more effective in producing relaxation. However, there were no significant differences between the groups in sleep satisfaction, anxiety, postoperative days of

hospitalization and use of analgesics. In general, the idea of the use of tapes was well received by patients.

Conclusions and Recommendations

The purpose of this study was to develop and clinically evaluate a method of stress reduction for open heart surgery patients that employed the techniques of relaxation and the suggestion of positive expectancies. The results of this study, both quantitative and qualitative, have been presented, interpreted, and discussed. This section will present an integrated discussion of these results followed by specific recommendations for future research.

Development of the treatment method. In developing a treatment method certain guidelines were followed. The first guideline for development was efficiency in terms of time, money, and ease of use. This was to help solve problems that had been related to lack of use of similar procedures in the past, even when shown to be effective by research. Truly, the cost of this intervention was small, the price of some portable tape recorders and some tapes. The tapes were easily recorded and copied by hospital personnel. Almost all of the patients found the tapes easy to use, as did the nursing staff. Time, however, was found to be a complicating factor. Patients were sometimes very busy the day before surgery, and usually listened to the tape one time

versus the prescribed two times. The nursing staff in the intensive care unit (ICU) were found to play a key role. Although some patients did request the tape from the ICU nurses, most patients were quite dependent on the nurses' care for absolutely everything, including the tapes. The nursing staff did not report that they found it difficult or time consuming to use the tapes. However, they often forgot to play them or did not take primary responsibility in making sure it got done on their shift. Thus, although minor problems did arise, the use of tapes as a treatment method clearly met the first developmental guideline.

The developmental guidelines also suggested that the treatment method be acceptable to patients and involve them actively in their own recovery. The high degree of participation and the overall positive response of most of the patients demonstrates that the idea was, in general, not only acceptable, but popular. Patients were generally receptive, cooperative, and even appreciative. In summary, the results of this study suggest that the treatment did meet the developmental guidelines.

Evaluation of the treatment method. How much and in what ways was the treatment method effective in reducing the stress of hospitalization for open heart surgery? A discussion of effectiveness starts by mentioning that the

treatment tape (music with relaxation instructions and the suggestion of positive expectancies) was more effective than the control tape (music), in reducing self-reports of pain in the first five postoperative days. Pain was felt to be influenced due to the effectiveness of the tape in producing relaxation, due to the specific suggestions offered for dealing with pain, and due to the caring element offered by the development and use of the tape. The treatment tape was also significantly more effective in producing relaxation. The treatment did not appear effective, at least when compared with the music control tape, in speeding or improving recovery and reducing stress as measured by other dependent variables.

The effectiveness of the treatment method was also supported by the favorable comments made by patients in response to the tapes. Thus, the treatment method appeared to be relevant to the problem. Consideration of the ICU experience offers a good example. The ICU experience is perhaps the worst in terms of subjective experience during an open heart surgery patient's recovery. Patients often report that they are least prepared for this experience (Kennedy, 1966; Miller and Shada, 1978), despite preoperative teaching. Problems include sleep deprivation, sensory isolation, decreased communication ability, breathing problems, and fears related to both the problems mentioned above and

others, such as being hooked up to numerous monitoring devices, tubes, etc. (Dlin, et al., 1968). The treatment developed for this study was decidedly relevant to these problems. For example, both the music tape and the suggestion tape were repeatedly mentioned by patients as useful sleep aids. Patients also reported that both the treatment and the control tape helped them deal with sensory isolation problems. Patients favored having different types of music available to help them "get away from it all" for awhile each day. Breathing problems were also a major factor addressed by the suggestions in the treatment tape. Specific suggestions to relax and breathe, and to remember that they are getting better as they cough, were found to be helpful by patients. Certainly, under conditions of decreased communications, it would be helpful to have a friendly voice address your fears and problems in a gentle, but helpful and reassuring manner. Away from the ICU, the tapes were seen as useful also, especially preoperatively. In conclusion, the treatment, and to some extent even the music control tape, was relevant and effective.

Recommendations. Recommendations will now be made for both the future development and evaluation of effectiveness of the type of treatment method used in this study. Even though the treatment developed for this study met developmental guidelines, the results suggest ideas for improvement

that may be necessary to insure the future success of this type of project. First, the nurses in the intensive care unit often either forgot to play the tapes or did not take primary responsibility for making sure they were played on their shift. This raises the issue of how to introduce a new and different treatment such that staff cooperation is maximized. In fact, this issue qualifies as another important treatment developmental guideline. The following recommendations are made to help solve this problem. First, it is recommended that the surgeon involvement be increased by having that person record the suggestion tapes and introduce them to the patient in person. The importance of extending the personal touch of the surgeon in this manner was verified by subjective comments of patients during the study. It is also verified in past research on hypnosis with surgery. Kolouch (1962, 1964), Doberneck, et al. (1959), and Bonilla (1961), whose studies were presented in the review of the literature, all emphasized the importance of the interpersonal relationship between patient and surgeon and noted the increased patient cooperation developed by the use of hypnotic suggestion by the surgeon. Second, an in-service program for the nursing staff is recommended for the purpose of education about the value and importance of this type of program. Intensive care nurses deal with life and death in a continual drama that often under-

plays the importance of psychological care. A more structured schedule of use of the tapes would perhaps help the nursing staff as they can be quite busy at times and simply forget. It is believed that increasing the credibility and valuation of the intervention through the above recommendations would greatly increase both the frequency of use and the power (credibility) of the intervention for both patients and medical personnel.

A final recommendation to be included under developmental considerations is that the treatment be introduced prior to hospitalization. Some patients made this suggestion and prior studies have often taken this approach. The current problem with preoperative instruction in stress reduction is that patients usually do not arrive at the hospital until the day before surgery. This is due to increased medical knowledge which has eliminated the need for a long preoperative hospitalization. This author believes that self-explanatory tapes, dictated by the surgeon, could be given or mailed to patients when the decision for surgery is first made. Open heart surgery is most often an elective procedure, and time is available before surgery. Introducing this idea earlier would allow patients more time to learn and practice relaxation techniques under less stressful conditions. Such an intervention would probably help patients cope with pre- and postsurgical anxiety. Finally,

prior studies, such as Aiken and Heinrichs (1971), which used presurgical instruction over a several day period, were effective in reducing not only postoperative psychiatric complications, but also in reducing several factors judged to indicate surgical stress including degree of hypothermia, amount of time on cardiopulmonary bypass, amount of time under anesthesia, and total units of blood.

The recommendations for evaluation of effectiveness start with the suggestion to complete the collection of data for the no tape control condition. This will allow an evaluation of the effect of the music tape which was indicated by subjective comments from patients to be useful, especially for sleep and anxiety control. The second recommendation is that a follow-up study be done one and two years later with the patients in this study. Titchener (1960) stated that the psychological response to hospitalization and the persistance of a stress state is observable not only in the recovery period, but in convalescence, and perhaps long after, in purely psychological symptoms such as depression, anxiety, phobias, or in a change in character, lifestyle, or a fixed response to stress, in unconscious resistance to surgical treatment, and in continuing somatic symptoms. Also, this author has met patients who had open heart surgery who expressed bitterness about the experience, expressed "heart hypochondriasis", or expressed depression.

The pain ratings and subjective comments by the patients of this study suggest that heart surgery involves much more than heart repair. The psychological impact of heart problems or failure reaches a peak when heart surgery is required, and the psychological experience that accompanies heart surgery probably persists long after the surgery is completed. Questions in the follow-up study can help assess the psychological impact of surgery and the impact of the treatment method over a longer period of time.

The third recommendation is that the study be replicated to help validate the results of this initial study and increase the generalizability of the results. In light of the data analysis and patient comments, certain recommendations can be made in designing a replicate study. The factor analysis suggested that the number of measures could be reduced. Five of the measures were interpreted to ask the same general question, "How do you feel today?" It is recommended that the measure of pain be retained as it incorporates this general question and also is believed to have assessed the important psychological dimension of suffering. If a measure of anxiety is desired, it is recommended that an even briefer assessment tool, perhaps a shortened STAI form, be used. It is also recommended that a general question of, "How well are you coping with your problems today", be included. This recommendation reflects

this author's belief that qualitative data are quite useful in evaluating the results of this type of research. Another recommendation for replication is to further differentiate the effects of this type of treatment on sleep, a major problem for the patients postsurgically. Most of the patients felt that the tapes helped, but scores on sleep satisfaction showed no significant difference between groups. The collection of a no tape condition will help clarify this issue. However, it is believed that, in addition, some differentiation should be made between daytime and nighttime sleep satisfaction.

Revisions are also suggested for the objective indices of recovery. Even though they were not found to be significantly affected by the treatment in this study, they are believed to be important and may be shown to be influenced after the no tape control condition data are collected or in a study of longer duration. The use of sedatives and the incidence of increased temperatures are not recommended measures due to irregularities in observation and difficulties in scoring. The use of analgesics and the number of postoperative days are recommended to be retained. It is recommended that these measures be cross-referenced to patient attitudes to help evaluate the effects of hospital policy versus patients' needs. For example, patients might be asked daily if they were satisfied with the amount of

medication they were receiving. Recommendations can also be made for the use of control variables. Since location was the only variable to be significantly related to many of the outcome variables, it is recommended that the V.A. Hospital population be studied apart from the University Hospital population. A completely randomized design is advocated for controlling other sources of extraneous variance. Another recommendation is to study patients' ability to relax as an independent variable. It has now been twice indicated, both in Fields (1974) and in this study, to be a possible predictor of the effectiveness of relaxation or hypnotic interventions.

In summary. Relaxation and the suggestion of positive expectancies, delivered by means of a taped recording, is concluded to be an easy to use, cost efficient, and effective method of stress reduction as measured by pain ratings, relaxation ratings, and patients' expressed psychological satisfaction. Recommendations for future development include increased involvement of the surgeon in making and introducing the tapes, increased nurse education about the value and credibility of the tapes, and increased preoperative use of the tapes. Recommendations for future evaluation of effectiveness include the collection of data with a no tape control condition to further evaluate the data

collected in this study, the completion of a long-term follow-up study on this research, and the designing of a replication study using the knowledge gained in this study for revisions.

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Appendix A

Transcripts of Taped Introductions and Instructions

Introduction to all Tapes

Hello, this is Dr. Copeland. Thank you for taking part in our stress reduction program. We believe that what you are about to do will help you to help yourself to a more comfortable and speedier recovery. As you know, heart surgery offers you a chance to resume a healthy life again. Yet, coming to the hospital and having major surgery also places physical, emotional, and mental stress on you. Such stress is associated with a state of high arousal which includes the subjective experience of nervousness, anxiety, and pain, as well as a bodily state of increased heart rate, blood pressure, and muscle tension. This higher arousal state that you may or may not be aware of is a natural response to stress. However, there is another natural response that is just the opposite of stress, that of relaxation or low arousal. This state is associated with feelings of calmness, confidence, and comfort, as well as a bodily state of decreased heart rate, blood pressure, and muscle tension. This state is associated with both physical and mental health, and can be achieved by everyone.

While in the hospital, you will be asked to listen to a taped program of stress reduction exercises twice daily to help you to help yourself to a more comfortable and healthy recovery.

I will now introduce you to Dr. Bernat, who will guide you in these stress reduction exercises designed to help you help yourself.

Thank you.

Instructions for the Music Control Tape

Hello, this is Dr. Bernat. Relaxation is a simple and natural process. To produce a state of low arousal, sit back or lie down comfortably, then close your eyes, and listen to the music ..... this music has been specially chosen to help you relax. A passive, quiet attitude is best. If distracting thoughts occur, just disregard them and redirect your attention to the music. Remember, worrying about your performance will only arouse you so just let go and relax. Allow your body and mind to work together in helping you to relax and prepare for a comfortable and speedy recovery.

Instructions for the Pre-surgery Treatment Tape

Hello, this is Dr. Bernat. Relaxation is a simple and natural process. To produce a state of low arousal, sit back or lie down comfortably, then close your eyes, and follow the instructions. Listen to the music ..... this music has been specially chosen to help you relax and learn without effort. A passive, quiet attitude is best. If distracting thoughts occur, just disregard them and redirect your attention to the exercise. Remember, worrying about your performance will only arouse you so just let go and relax. Just use your imagination to best experience what is suggested to you so that your body and mind will work together in helping you to relax and prepare for a comfortable and speedy recovery.

I'm sure you like the experience of relaxation and comfort and I would like you to just notice how much more relaxed you can become just by taking a deep, pleasant, comfortable breath, slowly, hold it for a second, notice the tension, and then letting go, relaxing as you exhale. Notice, just notice, that it takes no effort to exhale. You just let go and you relax. Every time you exhale or let go, your body relaxes a little more, so as I talk to you just be aware, just passively observe your own breathing just letting go and relaxing as you exhale. All parts of

your body and mind are now going to work together to achieve a comfortable and relaxed state.

Now, mentally repeat the following instructions, just let the words flow through your mind as you imagine what is suggested.

I breathe.... I keep breathing deeply and completely at this rate as I feel my body relax. I observe how relaxed I'm becoming, just by being conscious of my breathing. I may relax further simply by letting go of all muscular tension. I relax my eyelids. I notice how pleasant it is to relax them; how good it feels. I relax my face muscles; just let them go completely limp. I breathe in; I breathe out, deeply, completely. I allow my neck muscles to go limp and relaxed. Now I feel the tension going out of my shoulders, arms, forearms, and hands. I just let go and notice how good it feels. I breathe in, I breathe out, deeply, completely.

I relax my chest--it's already beginning to relax just by my deep pleasant breathing. I feel all the muscles relax. I breathe in, I breathe out, deeply, completely. I allow my abdomen to go loose and relaxed--what a good sensation it is. I relax more and more. I feel myself relaxing completely. I breathe in, I breathe out, deeply, completely.

Now my spine and back--I let them go. I notice that it takes no effort to relax. Indeed, letting go in this way requires far less effort because I just stop holding these muscles tense. I breathe in, I breathe out, deeply, completely.

Now my legs--I let them go really limp--my buttocks, my hips, my thighs, my calves, my feet. I notice how pleasant and good I feel as I relax more and more. I keep letting go. I breathe in, I breathe out. All the parts of my face are totally, completely relaxed. I feel only muscle relaxation in every part of my body.

My arms and legs are heavy and warm. My heart beat is calm and regular. My body breathes itself freely and comfortably. My abdomen is warm. My forehead is cool. My mind is quiet and still. I am at peace. I am totally, completely relaxed and comfortable. I see and feel my body and mind working in harmony, relaxed and comfortable, and in this state I see and feel myself resting comfortably in the hospital tonight, knowing that I am well prepared for my surgery tomorrow, and as I doze off to sleep tonight, I relax very deeply, sleeping very, very peacefully. And as I sleep I dream of myself sleeping and waking up refreshed, yet calm and relaxed, feeling confident as I am being well prepared for surgery by the doctors and nurses.

I feel confident as I am prepared for my surgery. I receive some medication that allows me to feel pleasantly drowsy and relaxed. Later, as I am wheeled into the operating room, I remain relaxed and ready to receive my anesthesia. The anesthesia allows me to rest comfortably during the operation and soon I totally relax and go to sleep. As I continue to dream, I see the doctors and nurses operating skillfully, repairing my heart and preparing me for recovery to a healthier life. Later, after the operation is successfully completed, I see myself being taken to the recovery room and then to the intensive care unit on the sixth floor of the hospital. My body has already started to heal itself. I see and feel my heart working well, beating rhythmically and regularly to help circulate fresh blood as my body heals itself, making me strong and healthy.

As I regain consciousness, I think about recovering quickly and I realize that by relaxing my body will respond more quickly to the normal healing process. After the operation, I tolerate the intravenous needles and the endotracheal tube, which helps me breathe. I remember to just relax, and to feel good. Although at times I am aware of some discomfort, it does not bother me, I just relax even more. My mind and body are relaxed and I concentrate on feeling good.

I feel safe and well cared for by the special nursing team and the cardiac monitoring devices in the intensive care unit. As I continue to dream, I see and feel myself getting stronger and stronger every day. My hospital stay is a restful holiday, helping my body to become strong and healthy. I sleep comfortably at night, dozing off after the normal nursing checks, waking up rested in the morning. I use my time in the hospital to take an interest in myself, other people, and the world.

I see myself daydreaming, looking forward to a healthier and happier life.... And now, as the dream fades away, just return to being aware of being relaxed, just be passively aware of your breathing, breathing easily and calmly, noticing that it takes no effort to exhale, letting go and relaxing, and taking a moment to enjoy this relaxed state, to feel good about your ability to feel good, to feel good about your ability to help yourself to a healthy and speedy recovery, knowing that relaxation and imagery will become easier and easier as you repeat these exercises.

Now just drift off to sleep with the music, or if you want to awaken, give yourself some suggestions to feel refreshed and mentally alert as you breathe in, doing this several times now...that's it...breathe in "refreshed", still comfortable and relaxed, yet refreshed.

Instructions for the Intensive Care Unit Treatment Tape

Hello, this is Dr. Bernat. Congratulations on a successful recovery. Here in the intensive care unit you are being cared for in a very special way by the doctors and nurses. Although at times you may be aware of the noise of the cardiac care machines, and of much staff attention, allow this to be reassuring to you of the good care you are receiving. Just relax and feel safe.

This tape is designed to help you achieve a state of relaxation, simply and naturally, and has suggestions to help you to help yourself to a speedy and comfortable recovery. So close your eyes and rest comfortably...listen to the music...the music has been specially chosen to help you relax and learn without effort. Just use your imagination to best experience what is suggested to you so that your body and mind will work together in helping you relax and prepare for a comfortable recovery.

First, just relax every muscle in your body...just let yourself go limp...you may even feel a heaviness come over your body...concentrate on allowing this heavy relaxed feeling to spread throughout your entire body...think to yourself that the muscles in your body deserve a good rest and that you are going to give it to them now by relaxing. Now, just mentally repeat the following instructions for relaxa-

tion. Just let the words flow through your mind as you imagine what is suggested.

I breathe.... I keep breathing deeply and completely as I feel my body relax. I observe how relaxed I'm becoming, just by being conscious of my breathing, I may relax further simply by letting go of all muscular tension. I relax my eyelids. I notice how pleasant it is to relax them; how good it feels. I relax my face muscles; I just let them go completely limp. I breathe in; I breathe out, deeply, completely. I allow my neck muscles to go limp and relaxed. Now I feel the tension going out of my shoulders, arms, forearms, and hands. I just let go and notice how good it feels. I breathe in, I breathe out, deeply, completely.

I relax my chest--it's already beginning to relax just by my deep pleasant breathing. I feel all the muscles relax. I breathe in, I breathe out, deeply, completely. I allow my abdomen to go loose and relaxed--what a good sensation it is. I relax more and more. I feel myself relaxing completely. I breathe in, I breathe out, deeply, completely.

Now my spine and back--I let them go. I notice that it takes no effort to relax. Indeed, letting go in this way requires far less effort because I just stop holding these

muscles tense. I breathe in, I breathe out, deeply, completely.

Now my legs--I let them go really limp--my buttocks, my hips, my thighs, my calves, my feet. I notice how pleasant and good I feel as I relax more and more. I keep letting go. I breathe in, I breathe out. All the parts of my face are totally, completely relaxed. I feel only muscle relaxation in every part of my body.

My arms and legs are heavy and warm. My heart beat is calm and regular. My body breathes itself freely and comfortably. My abdomen is warm. My forehead is cool. My mind is quiet and still. I am at peace. I am totally, completely relaxed and comfortable. I know that feeling relaxed and calm helps my body to heal itself. Still, at times, I may become aware of some discomfort, but it does not bother me, some sensations such as tightness...tingling ...or pressure are quite natural and can be felt without disturbance. My body knows how to heal, circulating fresh blood to my wounds. I relax, totally and completely. If I become aware of more discomfort, I relax even more, saying to myself: I'm ok, time to relax. I concentrate on a feeling of numbness in the area of discomfort...then as my discomfort melts away, I see myself relaxing even more and thinking of something pleasant, a pleasant dream...and I

feel very relaxed, thinking to myself I am totally, completely relaxed and comfortable.

As I dream, I see myself getting stronger every day, making rapid improvement day by day. To help myself improve I take pride in my ability to cough, helping to expand my lungs and clear them of phlegm. I see myself coughing, and if there is discomfort it doesn't bother me as I say to myself: I'm getting better and better. After my coughing exercises, I relax completely, letting my body begin to feel those heavy relaxed feelings all over. I think of a pleasant thought again, and soon find myself interested in something else, pleasantly relaxed.... My arms and legs are heavy and warm...my heartbeat is calm and regular...my body breathes itself freely and comfortably...my abdomen is warm...my forehead is cool...my mind is quiet and still...I am at peace...I am totally, completely relaxed and comfortable. As I rest I dream some more and I see and feel myself resting comfortably in the hospital. I sleep comfortably at night. I am reassured of my safety by the normal nursing care and I wake up rested in the morning. I use my time in the hospital to take an interest in myself and my surroundings, learning new things about myself, other people, and the world.

I see myself daydreaming, looking forward to a healthier and happier life. And now, listening to the music, I just return to being aware of being relaxed, just passively aware of breathing, breathing easily and calmly, noticing that it takes no effort to exhale, letting go and relaxing, and taking a moment to enjoy this relaxed state, to feel good, to feel good about your ability to feel good, to feel good about your ability to help yourself to a healthy and speedy recovery, knowing that relaxation and imagery will become easier and easier as you repeat these exercises.

Now just drift off to sleep with the music, or if you want to awaken, give yourself some suggestions to feel refreshed and mentally alert as you breathe in, doing this several times now...that's it...breathe in "refreshed", still comfortable and relaxed, yet refreshed.

Instructions for the Post-surgical Treatment Tape

Hello, this is Dr. Bernat. Congratulations, you are on your way to a successful recovery. By now you should be familiar with the process of relaxing and imagining as a way to help yourself to prepare for a more comfortable and speedy recovery. Again, to produce a state of relaxation and low arousal, sit back or lie down comfortably...close your eyes...listen to the music...and use your imagination to best experience what is suggested to you so that your body and mind will work together in helping you to relax.

I'm sure you like the experience of relaxation and comfort and I would like you to just notice how much more relaxed you can become just by taking a deep, pleasant, comfortable breath, slowly, hold it for a second, notice the tension, and then letting go, relaxing as you exhale. Notice, just notice, that it takes no effort to exhale. You just let go and relax. Every time you exhale or let go, your body relaxes a little more, so as I talk to you just be aware, just passively observe your own breathing, just letting go and relaxing as you exhale. All parts of your body and mind are now going to work together to achieve a comfortable and relaxed state.

Now, mentally repeat the following instructions, just let the words flow through your mind as you imagine what is

suggested.

I breathe.... I keep breathing deeply and completely at this rate as I feel my body relax. I observe how relaxed I'm becoming, just by being conscious of my breathing. I may relax further simply by letting go of all muscular tension. I relax my eyelids. I notice how pleasant it is to relax them; how good it feels. I relax my face muscles; just let them go completely limp. I breathe in; I breathe out, deeply, completely. I allow my neck muscles to go limp and relaxed. Now I feel the tension going out of my shoulders, arms, forearms, and hands. I just let go and notice how good it feels. I breathe in, I breathe out, deeply, completely.

I relax my chest--it's already beginning to relax just by my deep pleasant breathing. I feel all the muscles relax. I breathe in, I breathe out, deeply, completely. I allow my abdomen to go loose and relaxed--what a good sensation it is. I relax more and more. I feel myself relaxing completely. I breathe in, I breathe out, deeply, completely.

Now my spine and back--I let them go. I notice that it takes no effort to relax. Indeed, letting go in this way requires far less effort because I just stop holding these muscles tense. I breathe in, I breathe out, deeply, com-

pletely.

Now my legs--I let them go really limp-my buttocks, my hips, my thighs, my calves, my feet. I notice how pleasant and good I feel as I relax more and more. I keep letting go. I breathe in, I breathe out. All the parts of my face are totally, completely relaxed. I feel only muscle relaxation in every part of my body.

My arms and legs are heavy and warm. My heartbeat is calm and regular. My body breathes itself freely and comfortably. My abdomen is warm. My forehead is cool. My mind is quiet and still. I am at peace.

I am totally, completely relaxed and comfortable. And to help myself relax even more, in my mind's eye, I am creating a vision of the most perfect, beautiful, natural area of relaxation that I can possibly conceive. I see my own ideal spot of relaxation, the one area in all of the world where I am most happy, most comfortable, most relaxed, my own ideal spot of relaxation. A place where I can totally let go. I see it, feel it, smell it, hear it, taste it; I totally experience it.

During the day, the time passes quickly as I get involved in my coughing exercises and breathing exercises as well as my walking exercises. As I cough and walk, I con-

centrate on getting stronger and stronger every day. I am aware of feeling better and better every day. I take pride in my efforts to help myself through these exercises as well as in taking time to completely relax myself. My body knows how to heal itself, circulating fresh blood throughout my body...I see and feel my heart working well, beating rhythmically and regularly.

My arms and legs are heavy and warm...my heartbeat is calm and regular...my body breathes itself freely and comfortably...my abdomen is warm...my forehead is cool...my mind is quiet and still...I am at peace...I am totally, completely relaxed and comfortable. I project myself into my ideal place of relaxation and as I see myself becoming totally relaxed, comfortable, carefree, with nothing to bother me, nothing to disturb me, just relaxed and comfortable. It's a place where time doesn't exist, just now, totally relaxed, comfortable, safe. And as I look around, I'm pleasantly surprised to notice something that I didn't notice before, and I relax even more. I see and feel my body and mind working in harmony, relaxed and comfortable, and in this state I see and feel myself resting comfortably in the hospital and as I doze off to sleep tonight, I relax very deeply, sleeping very, very peacefully. And as I sleep I dream of myself sleeping soundly and waking refreshed, yet calm and relaxed, feeling confident.

Although at times I am aware of some discomfort, it does not bother me, I just relax even more. My mind and body are relaxed and I concentrate on feeling good. As I continue to dream, I see and feel myself getting stronger and stronger every day. I sleep comfortably at night, waking up rested, using my time in the hospital to take an interest in myself and my surroundings, learning new things about myself, other people, and the world.

I see myself daydreaming, looking forward to a healthier and happier life. And now, as the dream fades away, just return to being aware of being relaxed, just be passively aware of your breathing, breathing easily and calmly, noticing that it takes no effort to exhale, letting go and relaxing, and taking a moment to enjoy this relaxed state, to feel good, to feel good about your ability to feel good, to feel good about your ability to help yourself to a healthy and speedy recovery, knowing that relaxation and imagery will become easier and easier as you repeat these exercises.

Now, just drift off to sleep with the music or if you wish to awaken, give yourself some suggestions to feel refreshed and mentally alert as you breathe in, doing this several times now...that's it...breathe in "refreshed", still comfortable and relaxed, yet refreshed.

Appendix B

Subject Consent Forms

CONSENT FORM

REDUCING THE STRESS OF HOSPITALIZATION

FOR OPEN HEART SURGERY

The purpose of this special project is to research methods for reducing the stress of hospitalization for open heart surgery. Your voluntary participation is being requested while you are in the hospital here at the Arizona Health Sciences Center, or at the Veterans Administration Hospital. If you decide to participate, you will be asked to take part in a brief personal interview today. The first five days after your surgery, you will be asked some questions about your experience. Your confidentiality is insured by the use of a coding system known only to this researcher. You will not be identified in any publications resulting from this study. All procedures should take only about ten minutes of your time each day. There is no discomfort or risk involved in this study. There are no costs or expenses involved for you to assume in connection with this study. There is the possible benefit of reduced stress during hospitalization and a better recovery.

"I have read the above 'Subjects Consent'. The nature, demands, risk, and benefits of the project have been explained to me. I understand that I may ask questions and I am free to withdraw from the project at any time without

incurring ill will (or affecting my medical care). I also understand that this consent form will be filed in an area designated by the Human Subjects Committee with access restricted to the principal investigator or authorized representative of the particular department. A copy of this consent form is available to me upon request."

Subject Signature_____Date_____

Witness Signature_____Date_____

CONSENT FORM

REDUCING THE STRESS OF HOSPITALIZATION

FOR OPEN HEART SURGERY

The purpose of this special project is to research methods for reducing the stress of hospitalization for open heart surgery. Your voluntary participation is being requested while you are in the hospital here at the Arizona Health Sciences Center, or at the Veterans Administration Hospital. If you decide to participate, you will be asked to take part in a brief personal interview today. The first five days after your surgery, you will be asked some questions about your experience. Your confidentiality is insured by the use of a coding system known only to this researcher. You will not be identified in any publications resulting from this study. You will also be asked to listen to a brief 15 minute tape recording two times each day, except the day of your operation. All procedures should take only about 35 minutes of your time each day. There is no discomfort or risk involved in this study. There are no costs or expenses involved for you to assume in connection with this study. There is the possible benefit of reduced stress during your hospitalization and a better recovery.

"I have read the above 'Subjects Consent'. The nature, demands, risk, and benefits of the project have been explained to me. I understand that I may ask questions and I

am free to withdraw from the project at any time without incurring ill will (or affecting my medical care). I also understand that this consent form will be filed in an area designated by the Human Subjects Committee with access restricted to the principal investigator or authorized representative of the particular department. A copy of this consent form is available to me upon request."

Subject Signature_____Date_____

Witness Signature_____Date_____

Appendix C

Letter to the Nursing Staff

THE UNIVERSITY OF ARIZONA
HEALTH SCIENCES CENTER
TUCSON, ARIZONA 85724

COLLEGE OF MEDICINE
DEPARTMENT OF ANESTHESIOLOGY

December 11, 1979

MEMO

To: Nursing Staff of
VA Hospital and
Arizona Health Sciences Center

Re: STRESS REDUCTION PROGRAM FOR OPEN HEART SURGERY PATIENTS.

The department of anesthesiology (Robert Crago) in cooperation with the department of surgery (Drs. Copeland and Saloman) of the Arizona Health Sciences Center and the department of cardiology (Dr. Steven Goldman) VA Hospital is sponsoring an experiment in stress reduction for patients undergoing open heart surgery (CABs and Valves). Cassette recordings of relaxation music, instruction in relaxation, and the suggestion of positive expectancies to help patients are being given to patients to listen to the day before surgery and the first five days after surgery. A pilot study showed good results in reducing patients reported pain and anxiety levels. It is a project that allows patients to help themselves.

Patients who are part of this project will have a tape recorder, a cassette, and a set of earphones with instructions to play it two times daily; once between 8 AM and 5 PM and once at or near bedtime. After listening to the tape, they are to record that they followed the procedure by recording their relaxation level on a small piece of paper attached to the top of the tape recorder. Researchers will visit the patients daily between five and seven PM to talk to the patient and have them rate how they feel. We are asking for nursing personnel to cooperate by checking with the patient each day to see if they remembered to listen to the tape. Most patients will do this themselves, however, some patients need some encouragement and your help is greatly needed and appreciated to ensure proper evaluation of these procedures. A 3x5 index card will be placed in the patients chart and/or the nursing index, to alert nursing staff which patients are part of this project. Your help is greatly appreciated. Please feel free to ask questions of the research assistant (Karen Brooks) and/or call 626-6239 and ask for Robert Crago. Thank you.

B. Robert Crago, M.S.
Research Associate and
Pain Clinic Counselor

cc: Jack G. Copeland, M.D.
Neal W. Saloman, M.D.
Steven Goldman, M.D.

Appendix D

Relaxation Chart

Patient Relaxation Rating Form for Nursing Staff

Name_____ DOS_____

This patient is in the Stress Reduction Study. Please play the tape for him and get ratings once between 8AM and 5PM and once at bedtime.

Date	Time 8AM	Time 5PM	Rating	Time H.S.	Rating

Rating Code:

0 - not relaxed, tense, couldn't concentrate, distracted
10 -
20 -
30 -
40 -
50 - moderately relaxed, mind may have wandered a little, but was able to listen
60 -
70 -
80 -
90 -
100 - very relaxed, totally absorbed in the tape, really felt good

Tape Rating Form For Patients

Please indicate how you felt while listening to the tape recording using the following scale:

0 - not relaxed, tense, couldn't concentrate, distracted
10 -
20 -
30 -
40 -
50 - moderately relaxed, mind may have wandered a little, but was able to listen
60 -
70 -
80 -
90 -
100 - very relaxed, totally absorbed in the tape, really felt good

Appendix E

State Anxiety Inventory

SELF-EVALUATION QUESTIONNAIRE

Developed by C. D. Spielberger, R. L. Gorsuch and R. Lushene

STAI FORM X-1

NAME _____ DATE _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *feel* right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	①	②	③	④
2. I feel secure	①	②	③	④
3. I am tense	①	②	③	④
4. I am regretful	①	②	③	④
5. I feel at ease	①	②	③	④
6. I feel upset	①	②	③	④
7. I am presently worrying over possible misfortunes	①	②	③	④
8. I feel rested	①	②	③	④
9. I feel anxious	①	②	③	④
10. I feel comfortable	①	②	③	④
11. I feel self-confident	①	②	③	④
12. I feel nervous	①	②	③	④
13. I am jittery	①	②	③	④
14. I feel "high strung"	①	②	③	④
15. I am relaxed	①	②	③	④
16. I feel content	①	②	③	④
17. I am worried	①	②	③	④
18. I feel over-excited and "rattled"	①	②	③	④
19. I feel joyful	①	②	③	④
20. I feel pleasant	①	②	③	④

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Appendix F

Daily Ratings Format

COMFORT RATING FORM

Please indicate your average experience of comfort or pain for today on the following scale.

0 - no pain or discomfort whatsoever
10 -
20 -
30 -
40 -
50 - moderate pain
60 -
70 -
80 -
90 -
100 - the worst pain you can imagine, pain so bad you would kill yourself

SLEEP SATISFACTION RATING FORM

Please indicate how satisfactory your sleep was last night on the following scale.

0 - very, very poor, no sleep
10 -
20 -
30 -
40 -
50 - moderately satisfactory
60 -
70 -
80 -
90 -
100 - excellent, satisfying sleep

STRENGTH AND ENERGY RATING FORM

Please indicate your average experience of strength and energy for today, in general, on the following scale.

0 - very weak, exhausted, no energy or strength
10 -
20 -
30 -
40 -
50 - moderate strength and energy
60 -
70 -
80 -
90 -
100 - excellent strength and energy

SELF-CARE RATING FORM

Please rate how much you feel you can help yourself or care for yourself today, in general, on the following scale.

0 - totally dependent, unable to help self, helpless
10 -
20 -
30 -
40 -
50 - moderate self-assistance possible
60 -
70 -
80 -
90 -
100 - totally self-reliant, able to care for self completely

INTEREST IN SURROUNDINGS RATING FORM

Please indicate how much interest you experienced today, in general, to your surroundings, (the people, events, and the place in which you find yourself) on the following scale.

0 - no interest at all, bored
10 -
20 -
30 -
40 -
50 - moderate interest
60 -
70 -
80 -
90 -
100 - very interested, fascinated

Appendix G

Psychosocial Stress Scale

SCHEDULE OF RECENT EXPERIENCE (SRE)

If any of these life events have happened to you in the last 12 months, please check in Happened column and enter value in Score column.

ITEM NO.	ITEM VALUE	HAPPENED ( )	YOUR SCORE	LIFE EVENT
1	100	_____	_____	Death of spouse
2	73	_____	_____	Divorce
3	65	_____	_____	Marital separation
4	63	_____	_____	Jail term
5	63	_____	_____	Death of close family member
6	53	_____	_____	Personal injury or illness
7	50	_____	_____	Marriage
8	47	_____	_____	Fired at work
9	45	_____	_____	Marital reconciliation
10	45	_____	_____	Retirement
11	44	_____	_____	Change in health of family member
12	40	_____	_____	Pregnancy
13	39	_____	_____	Sex difficulties
14	39	_____	_____	Gain of new family member
15	39	_____	_____	Business readjustment
16	38	_____	_____	Change in financial state
17	37	_____	_____	Death of close friend
18	36	_____	_____	Change to different line of work
19	35	_____	_____	Change in number of arguments with spouse
20	31	_____	_____	Mortgage over 10,000
21	30	_____	_____	Foreclosure of mortgage or loan
22	29	_____	_____	Change in responsibilities at work
23	29	_____	_____	Son or daughter leaving home
24	29	_____	_____	Trouble in in-laws
25	28	_____	_____	Outstanding personal achievement
26	26	_____	_____	Wife begin or stop work
27	26	_____	_____	Begin or end school
28	25	_____	_____	Change in living conditions
29	24	_____	_____	Revision of personal habits

30	23			
31	20	_____	_____	Trouble with boss
		_____	_____	Change in work hours or conditions
32	20			
33	20	_____	_____	Change in residence
34	19	_____	_____	Change in schools
35	19	_____	_____	Change in recreation
		_____	_____	Change in church activities
36	18			
		_____	_____	Change in social activities
37	17			
		_____	_____	Mortgage or loan less than $10,000
38	16			
39	15	_____	_____	Change in sleeping habits
		_____	_____	Change in number of family get-togethers
40	15			
41	13	_____	_____	Change in eating habits
42	12	_____	_____	Vacation
43	11	_____	_____	Christmas
		_____	_____	Minor violations of the law
TOTAL SCORE FOR 12 MONTHS			_____	

Thomas H. Holmes, M.D., Professor
Psychiatry and Behavior Sciences
University of Washington
Seattle, Washington 98195

Appendix H

Maudsley Personality Inventory

E N ?

1. Are you happiest when you get involved in some project that calls for rapid action? Yes ? No
2. Do you sometimes feel happy, sometimes depressed, without any apparent reason? Yes ? No
3. Does your mind often wander while you are trying to concentrate? Yes ? No
4. Do you usually take the initiative in making new friends? Yes ? No
5. Are you inclined to be quick and sure in your actions? Yes ? No
6. Are you frequently "lost in thought" even when supposed to be taking part in a conversation? Yes ? No
7. Are you sometimes bubbling over with energy and sometimes very sluggish? Yes ? No
8. Would you rate yourself as a lively individual? Yes ? No
9. Would you be very unhappy if you were prevented from making numerous social contacts? Yes ? No
10. Are you inclined to be moody? Yes ? No
11. Do you have frequent ups and downs in mood, either with or without apparent cause? Yes ? No
12. Do you prefer action to planning for action? Yes ? No
13. Are your daydreams frequently about things that can never come true? Yes ? No
14. Are you inclined to keep in the background on social occasions? Yes ? No
15. Are you inclined to ponder over your past? Yes ? No
16. Is it difficult to "lose yourself" even at a lively party? Yes ? No
17. Do you ever feel "just miserable" for no good reason at all? Yes ? No
18. Are you inclined to be overconscientious? Yes ? No
19. Do you often find that you have made up your mind too late? Yes ? No
20. Do you like to mix socially with people? Yes ? No
21. Have you often lost sleep over your worries? Yes ? No
22. Are you inclined to limit your acquaintances to a select few? Yes ? No
23. Are you often troubled about feelings of guilt? Yes ? No
24. Do you ever take your work as if it were o matter of life or death? Yes ? No
25. Are your feelings rather easily hurt? Yes ? No
26. Do you like to have many social engagements? Yes ? No
27. Would you rate yourself as a tense or "highly-strung" individual? Yes ? No
28. Do you generally prefer to take the lead in group activities? Yes ? No
29. Do you often experience periods of loneliness? Yes ? No
30. Are you inclined to be shy in the presence of the opposite sex? Yes ? No
31. Do you like to indulge in a reverie (daydreaming)? Yes ? No
32. Do you nearly always have a "ready answer" for remarks directed at you? Yes ? No
33. Do you spend much time in thinking over good times you have had in the past? Yes ? No
34. Would you rate yourself as a happy-go-lucky individual? Yes ? No
35. Have you often felt listless and tired for no good reason? Yes ? No
36. Are you inclined to keep quiet when out in a social group? Yes ? No
37. After a critical moment is over, do you usually think of something you should have done but failed to do? Yes ? No
38. Can you usually let yourself go and have a hilariously good time at a gay party? Yes ? No
39. Do ideas run through your head so that you cannot sleep? Yes ? No
40. Do you like work that requires considerable attention? Yes ? No
41. Hove you ever been bothered by having a useless thought come into your mind repeatedly? Yes ? No
42. Are you inclined to take your work casually, that is as a matter of course? Yes ? No
43. Are you touchy on various subjects? Yes ? No
44. Do other people regard you as a lively individual? Yes ? No
45. Do you often feel disgruntled? Yes ? No
46. Would you rate yourself as a talkative individual? Yes ? No
47. Do you have periods of such great restlessness that you cannot sit long in a chair? Yes ? No
48. Do you like to play pranks upon others? Yes ? No

Appendix I

Follow-up Questionnaire

THE UNIVERSITY OF ARIZONA
HEALTH SCIENCES CENTER
TUCSON, ARIZONA 85724

COLLEGE OF MEDICINE
DEPARTMENT OF ANESTHESIOLOGY

Dear Patient:

Recently you were hospitalized for open heart surgery at the University of Arizona Hospital and/or Veterans Administration Hospital. During your hospitalization you participated in a study of stress and reduction using pre-recorded cassette tapes. We hope you found this procedure helpful as it is helping us to learn how to care for others who undergo open heart surgery. We would appreciate if you would take five more minutes of your time to help us finish this piece of work. Please tell us openly and honestly how you felt about or would rate the following:

1. How useful to you were the stress reduction procedures, such as, tape recorder relaxation exercises and music?

2. Were the tapes available when you wanted them?

3. How effective were the stress evaluation procedures? (For example, ratings of pain, sleep, strength and energy, etc.)

4. Please comment on the research personnel you had contact with during this project.

		Understanding	Sympathetic	Personable
Mr. Robert Crago:	Yes	___	___	___
	No	___	___	___
Ms. Karen Brooks:	Yes	___	___	___
	No	___	___	___

5. Please make any further comments or suggestions you have about this project and personnel

Please put this completed questionaire in the enclosed self-addressed and stamped envelope and mail it back to the University Hospital. Please do not put your name on the envelope as we wish to continue to assure confidentiality. Thank you for your cooperation.

Jack G. Copeland, M.D.
Associate Professor
Department of Surgery

Neal W. Salomon, M.D.
Assistant Professor
Department of Surgery